NOVEMBER 18, 1948

# American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

*Building a Motorized Wheelbarrow . . . See page 2*

**HOW TO MACHINE VITALLIUM • ELECTROFORMING—a special report**

**WHAT SILICONES ARE, AND WHAT THEY DO**

# How a textile machinery manufacturer

# INCREASED PRODUCTION 275%

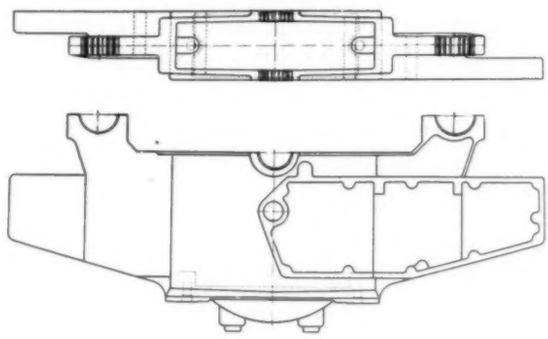
## with a new HEALD 321 Bore-Matic

Production of "gang frames" for textile machinery jumped from 30 parts to 113 parts per hour when this new Heald Bore-Matic went on the job. Now, four semi-circular bores in the zinc-die-cast part are finished automatically, with a single setting of the controls. The casting is precisely located from two dowel holes and the milled-off bottom surface, and is secured by manually-operated spring clamps. The machine then starts the automatic cycle — first rapid traversing the table to the left and borizing the left-hand center bore. A jump cam then rapid traverses the table further to the left, for finishing the two end cuts and the right-hand center bore.

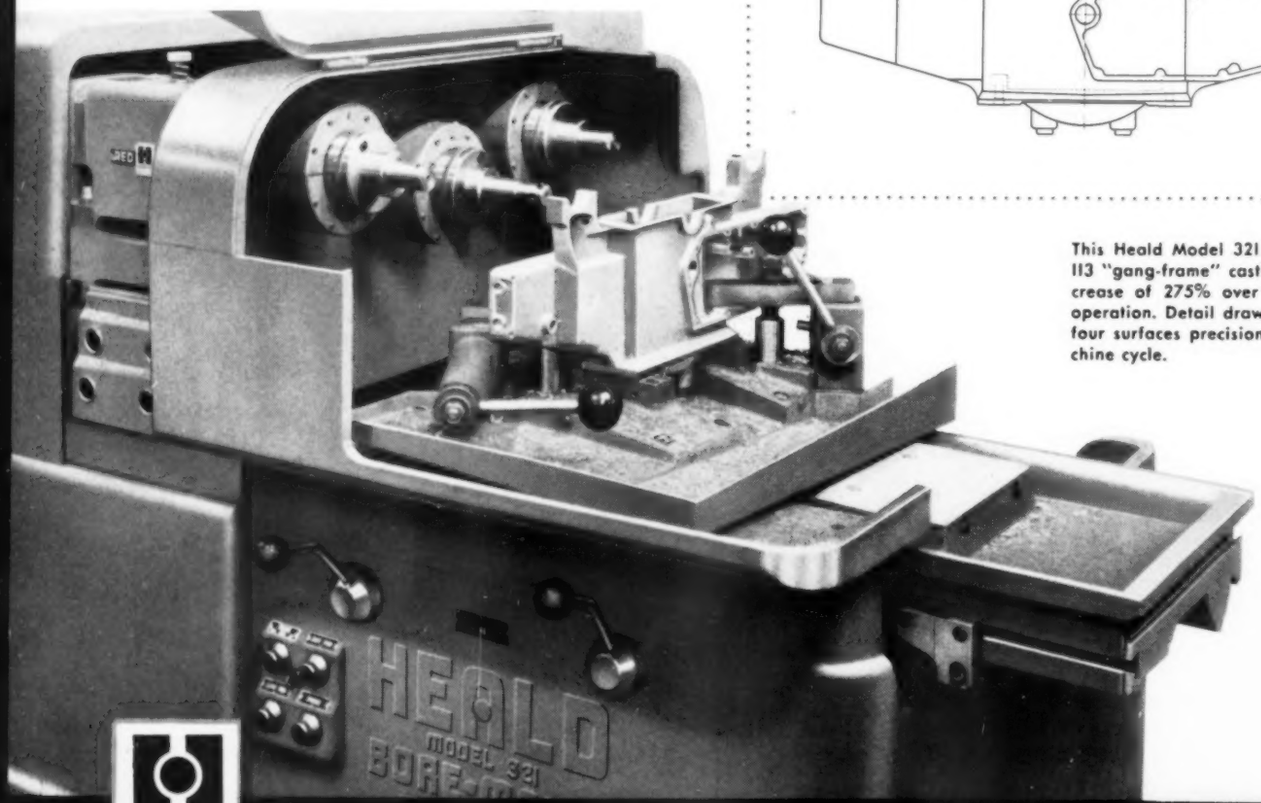
"Gang frames" may be a far cry from *your* precision finishing problem but the implication is obvious; faster, more efficient Heald Bore-Matics mean increased production and greater precision for you at *lower costs*.

### . . . AND HERE'S WHY:

1. **FASTER CYCLE** — jump cam and extremely fast table traverse speed up machine operation.
2. **EASE OF OPERATION** — all holes borized automatically after clamping and throwing starting lever.
3. **GREATER ACCURACY** — smooth table operation and high-precision, cool-running heads eliminate scrap.
4. **CONSTANT FEEDS** — hydraulic feeds and speeds retain their settings regardless of temperature changes.
5. **MINIMUM MAINTENANCE** — automatic lubrication and accessible operating units greatly reduce maintenance costs.



This Heald Model 321 Bore-Matic turns out 113 "gang-frame" castings an hour — an increase of 275% over previous method of operation. Detail drawing above shows the four surfaces precision finished in one machine cycle.




HEALD

**THE HEALD MACHINE COMPANY, Worcester 6, Mass.**

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# American Machinist

MAGAZINE OF METALWORKING PRODUCTION



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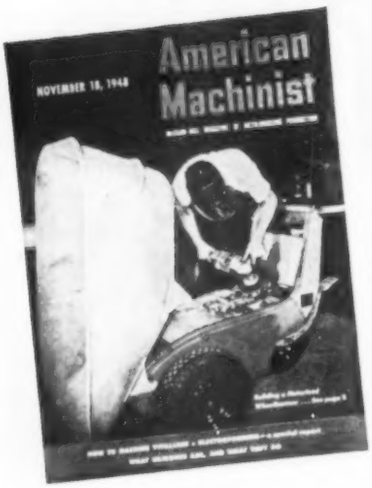


# Chips and QUIPS

***Our Cover*** . . . Bell Aircraft Corp. has begun manufacture of a motorized wheelbarrow called the "Prime Mover." Our cover Kodachrome shows touchup grinding before final painting. Illustrated is the bucket body, but a platform body can also be applied. The article by Arthur Hess, supt., in this issue shows the unusual assembly line and some clever machining setups.

***For Tool Men*** . . . Again we have a wealth of tooling material in addition to the previous articles. There's an excellent explanation of the tool-control system at Carrier Corp., by T. F. Dundon, supervisor of tools and supplies. It shows very graphically that proper control saves important money . . . Then there's a simple shop way to determine the carbon content of steels, worked out by a Lockheed and a Holden man. Don't miss it . . . For shorts, we describe the pentagonal layout "drum" table used by International Harvester, a special automatic feed on a Conomatic at Bristol Co., and the methods of cutter storage at Westinghouse.

***The Unusual*** . . . This issue includes several articles on unusual materials and processes . . . Leading off is a description of silicones and their present and potential applications in Metalworking, by Wm. T. Eveleth of G. E. . . . Then there's a step-by-step explanation of machining that "non-machinable" alloy, Vitallium, by Jesse Sdano of Allis-Chalmers. Carbides are the answer, on a material of great importance in the jet and gas-turbine program . . . Our own Chester Ricker describes how Buick casts Dynaflow rotors in plaster molds, using the Antioch process (*not* lost wax) which you'll be hearing more about as time goes on . . . And we have the basic information on electroforming, the process by which metal is built up around the holes, instead of being cut away to make them. This is a specialized job, but we thought you'd want the basic facts.

***No Scrap*** . . . *A.M.* for Sept. 23 told the story about the foundryman who offered blast-furnace executives prompt delivery of a new car in return for the same treatment on pig iron. Now comes George J. Dull, partner in Approved Casting Impregnating Co., 9301 Telegraph Road, Detroit 23, who writes that they can avoid considerable scrap for automotive plants—and machining time too. They impregnate leaky castings with tung oil or styrene resin and claim to have sealed cylinder heads, intake manifolds, water pumps, and motor blocks successfully . . . In other words, he's reversing the English by reducing the scrap castings available, thus cutting the need for pig to cast new ones. Mr. Dull will *never* get a car that way—but then he says he isn't interested in one "at the present."

***Selling at Home*** . . . Packard is selling its 10,000 employees on company advertising, showing how its campaign to the public provides the orders that make each worker's job, "steadier and more secure." Framed displays (18x20 in.) at each water cooler and time clock feature latest ads, with a terse explanation to employees . . . Material is changed every two weeks, hits hard at the idea that the advertising works for the worker, that it brings people into showrooms, that it reaches five families for a penny.

***Coming*** . . . Dec. 2 *A.M.* will include a potent selection of articles, starting with a cover showing precision threading at 2,000 rpm. and including a special report on master bases which can cut small-fixture costs . . . There are other articles on impact extrusion, welding white metal, thread rolling at Dodge, forging at International Harvester . . . Two engineers at National Supply describe how to attack the machining of a complex part, and we've details on the machine-replacement program of the B. & O. Railroad . . . With our usual departments, that'll provide a busy fortnight for you.

**CONTRACT SHOPMAN . . . John S. Denison, son of a small-town lawyer in northern Wisconsin, was graduated from high school in 1930. He got a year at the Arthur Hill Trade School in Saginaw, Mich., then became an apprentice toolmaker for Columbia Mills, Inc., Saginaw. His work on product improvements and labor-saving devices got him into Murray Corp., Detroit, as salvage analyst during the war, but he later switched to his own trade in the toolroom.**

**In '44 and '45 he was toolmaker for a Chicago shop that developed items "from fish-hooks to rug-washing machines." In '46 he started the Excel Machine Shop in Pekin, Ill., primarily to machine castings for a local non-ferrous foundry. It's an efficient 6-lathe-and-related-units shop, and confirmed his previous belief that understanding between buyer and seller can save a lot. He tells how and why in this issue.**

The Gleason No. 17A Tester simulates actual operating conditions . . . provides an immediate method for precise control of the quality of the gears during all stages of manufacture . . . demonstrates conclusively the gears are right before assembly. With this new hypoid tester, a running test may be given *in the Gear Cutting Department itself* with the gears correctly mounted in operating position, run under power, *as they are when mounted in final assembly* to demonstrate conclusively the smoothness and quietness of operation, the tooth bearing, tooth size, surface finish, runout and tooth spacing errors.

The **NEW No. 17A HYPOID TESTER** has a new feature for the automatic duplicating of backlash with each pair of gears being tested. Thus correct mounting may now be read simply and easily from an indicator.

**GLEASON** *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

***Builders of Bevel Gear Machinery for Over Eighty Years***

Rear controls of Plain and Universal Dial Types are conveniently grouped. The machine illustrated is a No. 3 Universal High Speed.

*Right:* Changing speeds and feeds at the rear working position.

# Cincinnati Dial Types

## ... MEET ALL YOUR REQUIREMENTS FOR GENERAL-PURPOSE MILLERS

No. 2 Plain High Speed Dial Type taking a test cut on a steel block. The new Dial Types take a real cut: 7½ hp—No. 2; 10 hp—No. 3; 15 hp—No. 4.

• Without a second thought, you probably could name a dozen or more requirements for your toolroom and general-purpose milling machines. And at the top of the list would be: wide range of speeds and feeds, *easily and quickly changed* throughout their entire range. Of all the milling machines you can name, CINCINNATI *Dial Types are the only ones that do this by power, with one lever, throughout the complete range of 192 to 1 feed ratio, and 75 to 1 speed ratio.* The operator in the illustration (directly above) shows how easily this is done at the rear operating position. He can do the same thing at the front operating position, too. ¶The new Dial Types have other features which would be high on anyone's requirement list: streamlined, heavily ribbed column; automatic lubrication; built-in electrical equipment; directional control levers conveniently grouped; Dynapoise overarm. ¶We should like to tell you more about these modern, cost reducing milling machines. May we send you a copy of catalog M-1623-1?

Dial Types convenient grouping of operating controls, at the front and rear working positions.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

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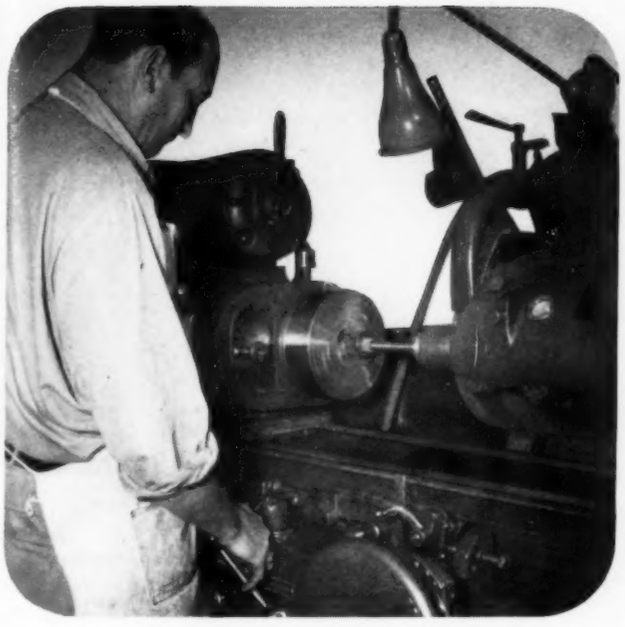


The internal grinding head is ready for work in a minute or less. In the illustration, the hole in a drill jig bushing is being ground to accurate size.

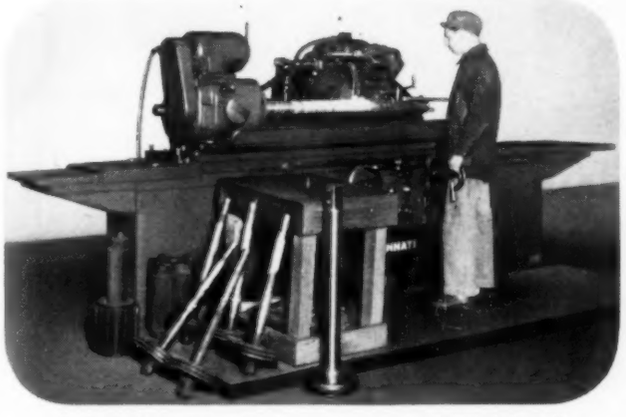
Grinding an exceptionally short part. Work of this type can be traverse ground on CINCINNATI FILMATIC Hydraulic Universals, because dog controlled table reciprocation with pick feed can be set as short as $^{3}/_{32}$".

FILMATIC

# To make a long ~~story~~ SETUP short...

## FILMATIC UNIVERSALS

## SAVE TIME IN YOUR SHOP



Typical shop shot, showing a CINCINNATI FILMATIC 14" Hydraulic Universal in action and the work assigned to it. Manufacturing quantities vary from one to five parts.

● How long does it take to get going on small lots? Whatever the answer is, set-up time constitutes one of the major elements in the cost of small quantity precision toolroom grinding. Reduce set-up time, and costs go down fast. You can be sure of brief setups on CINCINNATI FILMATIC Hydraulic Universals, for they have many features of value in small quantity production. To mention only three: hinged type internal grinding attachment, always on the job; Filmatic spindle bearings, never require adjustment; lathe standard spindle nose on headstock. ¶ The photographs show three setups which take advantage of CINCINNATI Hydraulic Universals' many features. Others have just as much value in reducing costs. All of them, plus complete specifications, are contained in these catalogs: 12" machine, G-486-4; 14", 16" and 18" machines, G-474-3. Send for copies.

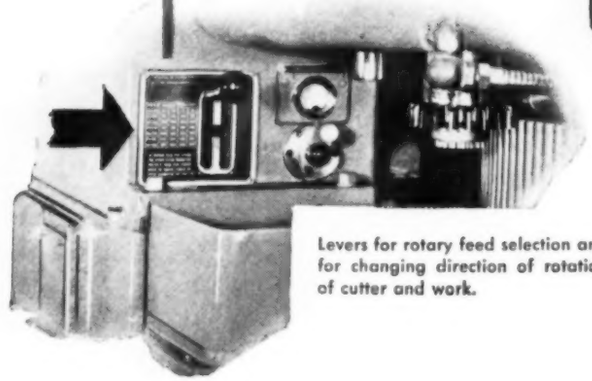
CINCINNATI

## CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

# The New Fellows



Levers for rotary feed selection and for changing direction of rotation of cutter and work.

## PRINCIPAL SPECIFICATIONS

**MAXIMUM CAPACITIES:**

| | |
|---|---|
| Pitch diameter (internal & external) | 36 in. |
| Pitch Spur | 3 |
| Helical | 4/5 |
| Face width (internal & external) | 5 in. |
| Helix angle (with standard guides) | 45° |

**PRINCIPAL DIMENSIONS:**

| | |
|---|---|
| Overall depth | 4 ft. 7½ in. |
| Overall length | 6 ft. 2 in. |
| Overall height | 7 ft. |

**WEIGHT:**

Of machine (completely equipped) .... 12,400 lbs. approx.

**STANDARD EQUIPMENT:**

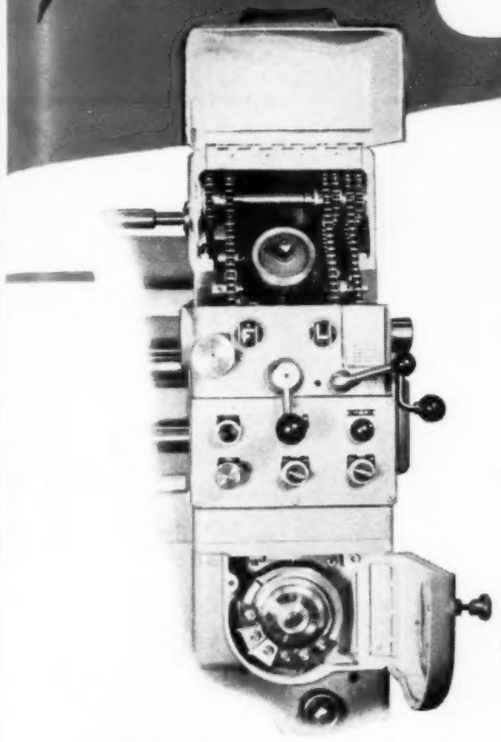
Lubricating pump and all connections; compound pump and integral motor, spur guide, change and feed gears to meet requirements.

**SPECIAL EQUIPMENT:**

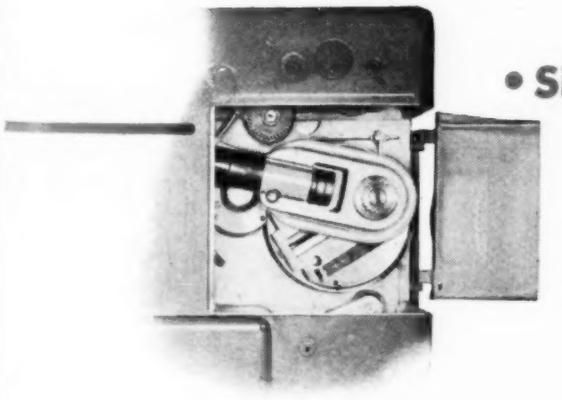
Lubricating pump, machine motors, outfits, fixtures, cutters.

# All-purpose 36" Gear Shaper

**For Spur Gears • Helical Gears • Herringbone Gears • External Gears • Internal Gears Cluster Gears • Cams • Splines • Special Profiles**



Quick selection of cutter speeds are grouped with "Start", "Jog" and "Stop" push buttons on this centralized control panel. Dial below controls setting for number of cuts.



Crank mechanism, and stroke setting scale. Note rugged construction, typical of all operating members of this machine.

## • Quick-Selective Cutting Speeds

Operator can obtain twelve different cutter speeds up to 300 strokes per minute.

## • Heavy Cuts at High Speed

This heavy-duty machine is equipped with a solid 4-inch cutter-spindle, and is of extremely rigid construction, permitting the taking of heavy cuts at high speed.

## • Traditional Fellows Precision

Operating on the generating principle with the inherent precision of Fellows cutters.

## • Quick Set-up Flexibility

Work apron can be easily withdrawn for loading and unloading heavy gears. New type relieving mechanism and apron locking mechanism.

## • Simple Operation

Feed and cutter speed set by dials at front of machine. Centralized push-button electrical control.

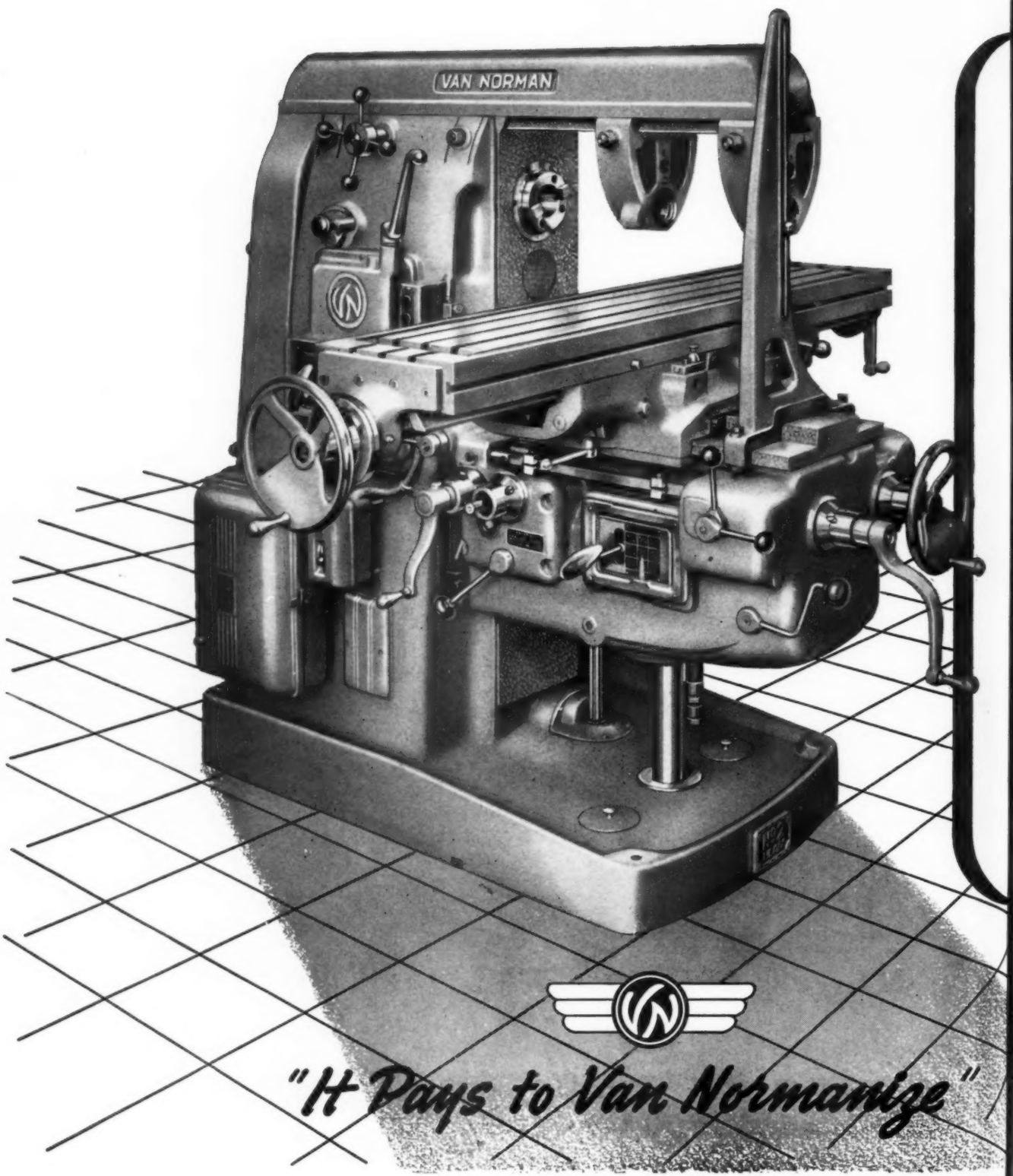
**Every gear shop will want complete information on the new Fellows 36-inch Gear Shaper. Write: The Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2, 640 West Town Office Bldg., Chicago 12, 7706 Empire State Bldg., New York 1.**

**Fellows**

**MACHINES AND TOOLS FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR**

# VAN NORMAN HORIZON

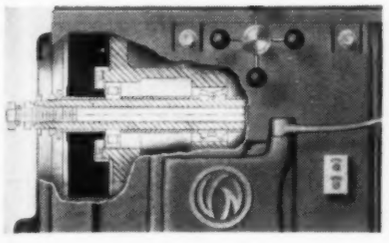
## *Provide Improved Cutability . . .*




*"It Pays to Van Normanize"*

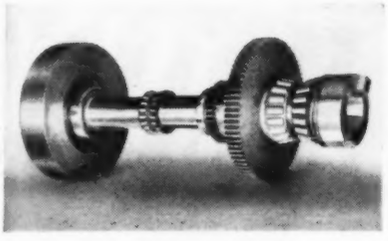
# ONTAL MILLING MACHINES

## Exceptional Ease of Control



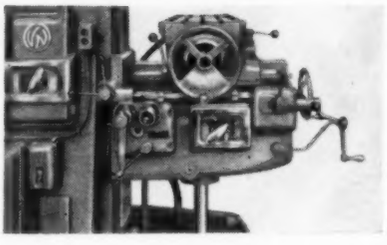
### Built-in Spindle Flywheel

The Van Norman spindle design incorporates a heavy flywheel mounted inside the column. It assures uniform, uninterrupted transmission of power to the cutter because it effectually cushions by its inertia, any fluctuation of speed and power. The flywheel increases and improves cutability . . . results in a smooth finish of work surface.



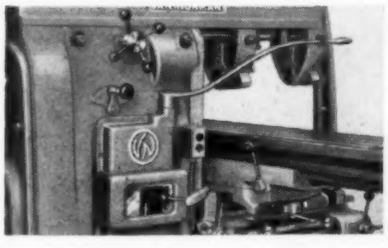
### 5-Bearing Spindle

The large diameter hardened alloy steel cutter spindle rotates on 5 anti-friction bearings. Large double-opposed taper roller bearings in front provide minimum overhang . . . center double-opposed taper roller bearings add rigidity. A straight roller bearing supports the rear. This construction assures maximum spindle support and rigidity under every type of cut.



### Front & Rear Power Control

All power feed controls, as well as 6-way rapid traverse, can be operated from front or rear of the machine. This dual feed control simplifies operation, saves time, reduces worker fatigue. The finger tip controls are directional and can be operated either with spindle stopped or rotating.



### Ease of Spindle Control

The single lever speed selector, convenient spindle reverse and spindle clutch levers are located on the side of the column for ease of control. The spindle clutch lever for starting and stopping the spindle is quickly adjusted to the desired and most convenient front or rear operating position.

From every angle, Van Norman Horizontal millers give you every advantage in cutability and ease of operation. These machines will give maximum quality service and increase production on a wide variety of general purpose and production milling. They are available in a wide variety of models and can be had with plain or universal saddles. Write for complete information.

**VAN NORMAN COMPANY**

**SPRINGFIELD 7, MASSACHUSETTS**

*Cut Threads*

# BETTER FASTER CHEAPER

WHY

*with*

## LANDIS DIE HEADS

1. LANDIS DIE HEADS cut tool cost by using chasers that are independent units. Worn or damaged chasers are reground or replaced individually, without affecting the remaining chasers of the set.

2. LANDIS DIE HEADS reduce tool inventories by cutting both right- and left-hand threads with a single set of chasers. Chasers are ground on both ends, the spring action in the die head is reversed, and either a right-hand or left-hand set of chaser holders is used.

3. LANDIS DIE HEADS cut all diameter threads with a constant pitch and form within the rated range of the die head with a single set of chasers. Short thread lengths larger than the rated diametrical range can be cut with the same die head equipped with over-size chaser holders.

4. LANDIS DIE HEADS use chasers that can be reground to 80% of their length. Regrinding is a simple operation restoring the entire cutting edge and leading feature, yet retaining the initial accuracy of pitch, diameter, and depth of cut.

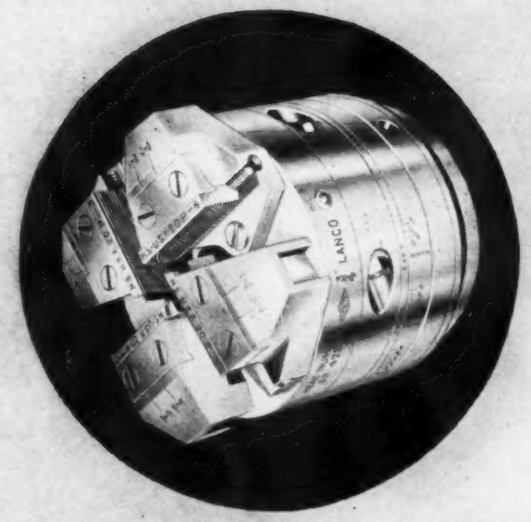
5. LANDIS DIE HEADS improve thread finish and cut production costs by reducing chaser wear and breakage. The tangential position of the chaser to the work allows lateral absorption of cutting strains. Resulting reduced friction and vibration make higher cutting speeds possible without causing thread distortion or chaser breakage.

6. LANDIS DIE HEADS consistently produce threads accurate for lead. Regrinding does not destroy the lead controlling feature of the chasers. Thus this feature assures accurate pitch threads throughout the chaser's life.

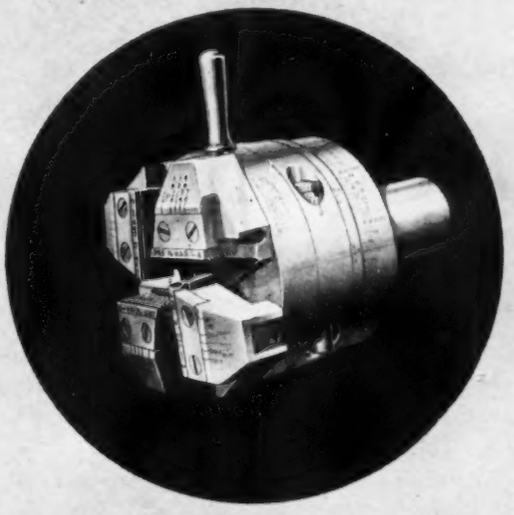
7. LANDIS DIE HEADS are built to stay on the production line. Tough, high-carbon steel is used in all parts. Rigid construction maintains accuracy, and minimizes wear of working parts. Landis Die Heads are furnished in two models, heat-treated or hardened-and-ground, depending on the application and quality of thread desired.

LANDIS Machine COMPANY

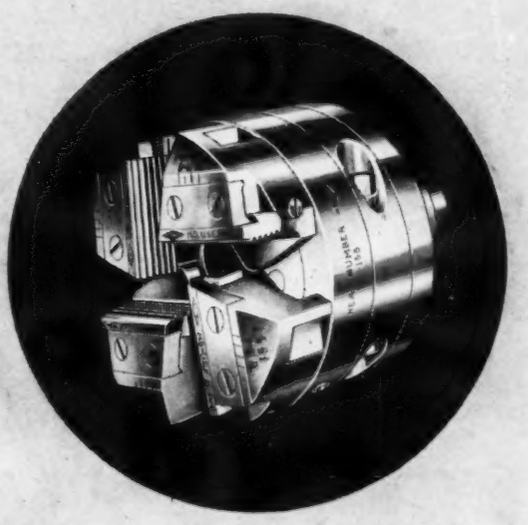
WAYNESBORO · PENNSYLVANIA



LANCO—a revolving die head for hand-operated semi-automatic, and automatic threading machines.

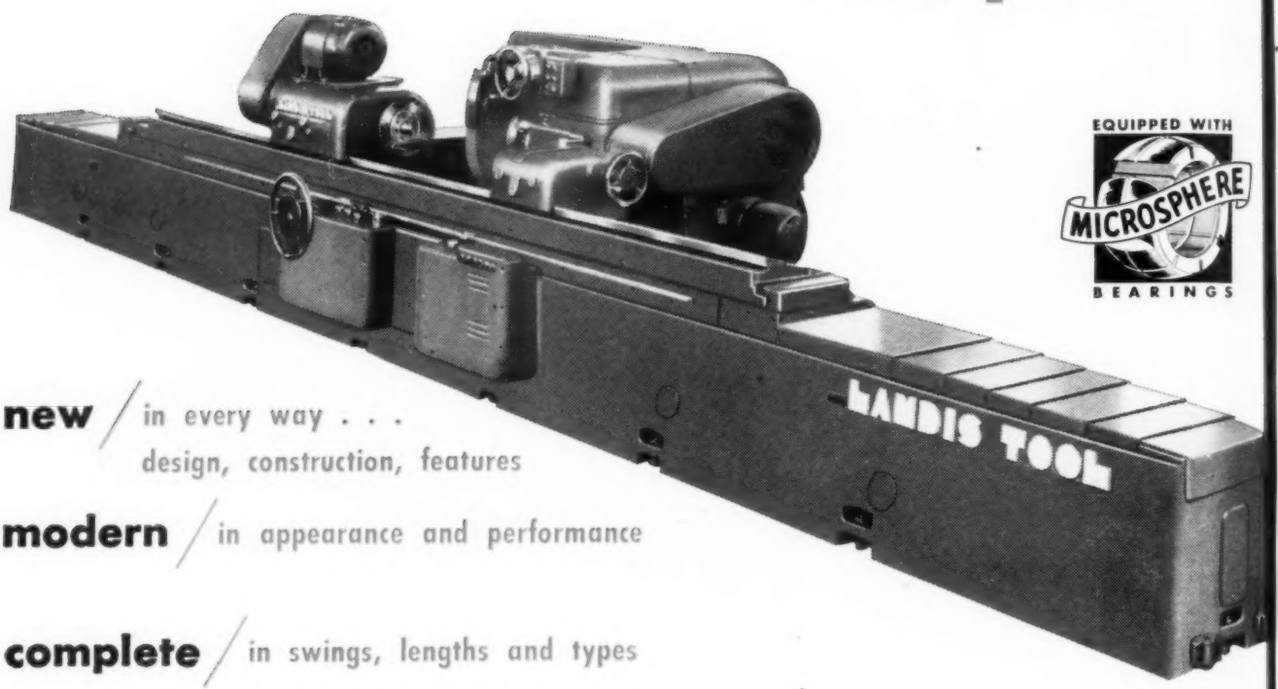


LANDMATIC—a stationary die head for turret lathes.



LANDEX—a revolving die head for automatic screw and other "live spindle" machines.

# new
# modern
# complete

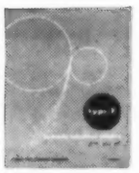



EQUIPPED WITH MICROSPHERE BEARINGS

**new** / in every way . . .
design, construction, features

**modern** / in appearance and performance

**complete** / in swings, lengths and types



Ask for Catalog F48

Production estimates and tooling suggestions will be made on the basis of your blueprints

## LANDIS TOOL
*Precision Grinders*

**Smooth traverse and reversal**

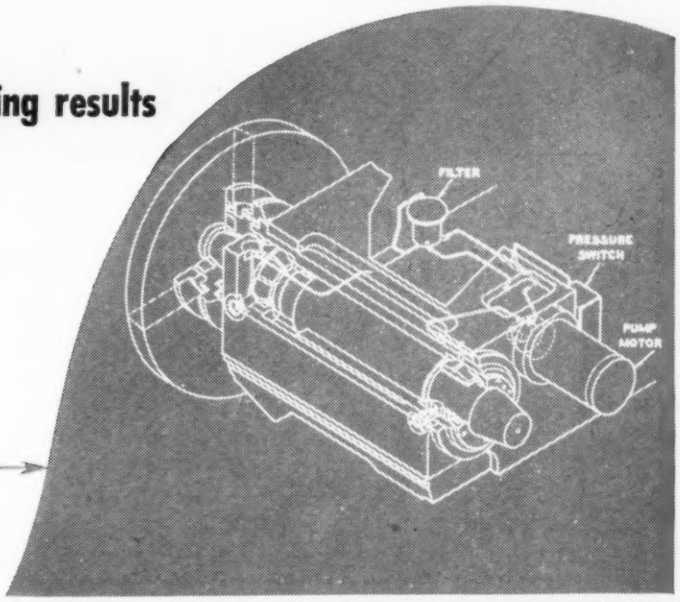
Hydraulic traverse in all lengths—centralized controls.

# LANDIS TOOL type F hydraulic cylindrical grinders

| Type | Swing | Lengths Between Centers | Maximum Weight On Centers |
|---|---|---|---|
| F Plain | 14″—16″ | 36″ to 168″ | 6,500 pounds |
| FF Plain | 16″—20″—24″ | 48″ to 240″ | 10,000 pounds |
| FF Plain Gap | 16″—40″ Gap | 96″ to 168″ | 10,000 pounds |
| FR Roll | 16″—20″—24″ | 48″ to 168″ | 10,000 pounds |

## features that give outstanding grinding results

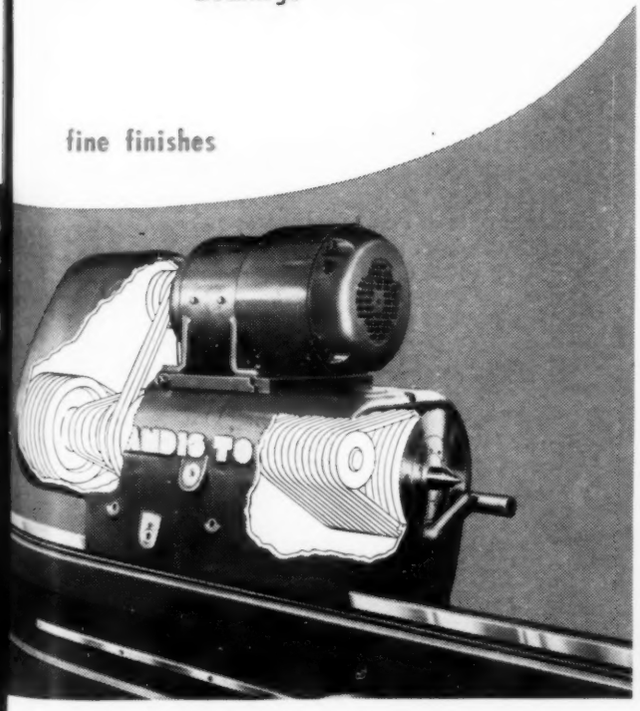
short grinding cycle

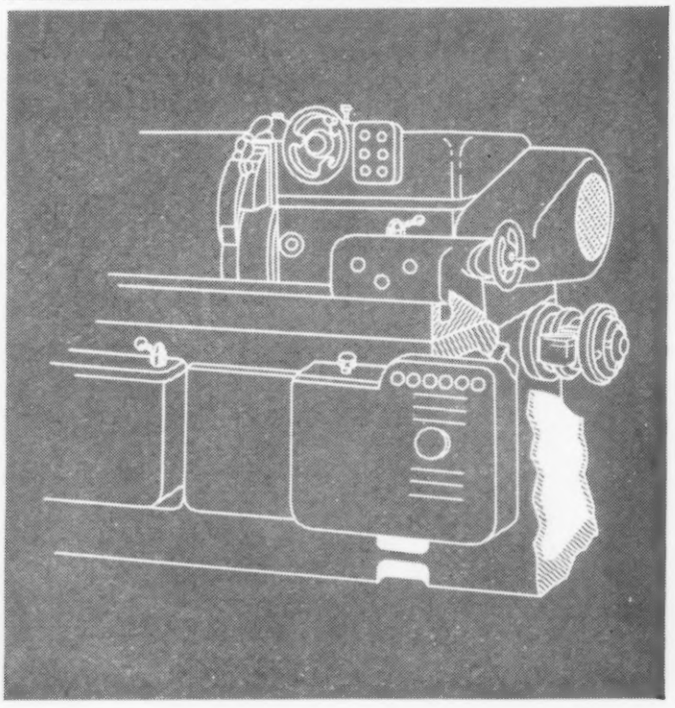



**Quick sparkout period and sensitive wheel feed**

Pressure Lubricated Microsphere Bearings

fine finishes





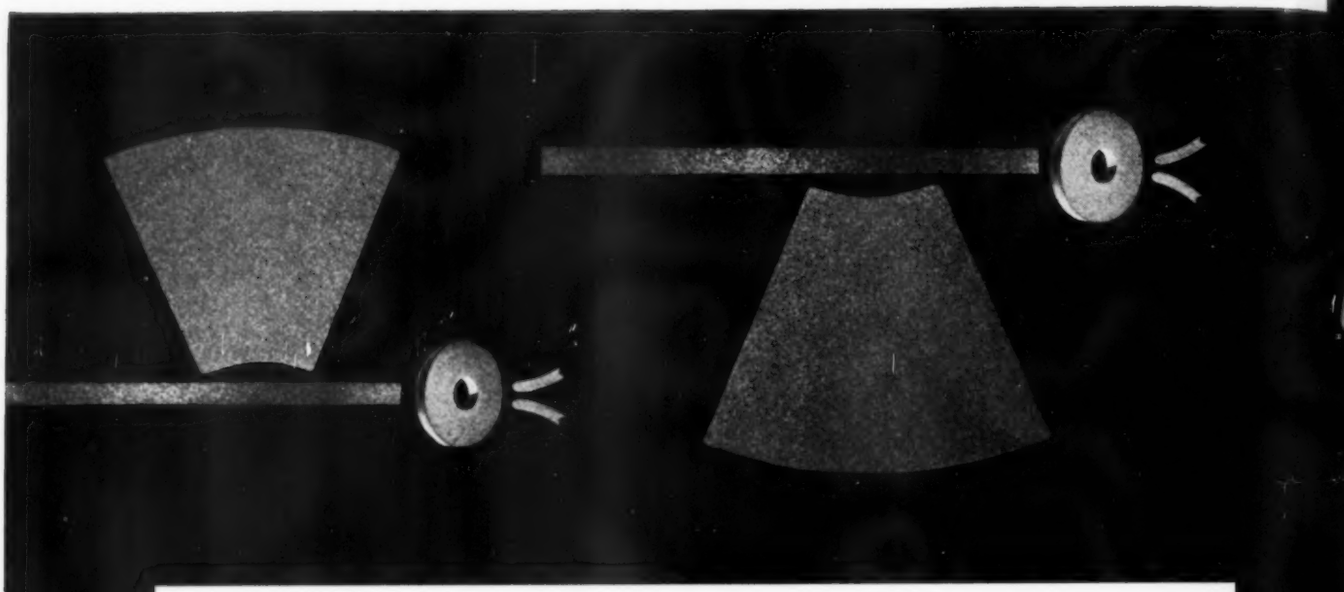
**Smooth transmission of power**

Complete Vee Belt drive used on headstock and wheel base.

**Choice of wheel feeds**

Automatic hydraulic feed standard. Four other combinations of hydraulic and electric feeds available.

LANDIS TOOL COMPANY / 10 E. SIXTH STREET / WAYNESBORO, PA.



# How to duck high grinding costs

***Are you*** certain that you're not paying higher grinding costs than necessary? There's a sure way to duck that extra expense.

***Not by*** buying cheaper wheels—that's always more expensive in the long run.

***No, the*** best way to drop your grinding expense is to get the *right* wheels for each grinding job . . . wheels that give you greater stock removal, better finishes, need less dressing, and last longer.

***This calls*** for a careful examination of your grinding needs *before you buy;* the exhaustive kind of examination Peninsular is prepared to conduct for you, in your own grinding department.

***Before recommending*** any wheels, Peninsular engineers analyze everything about your grinding operations: your machines, your methods, the materials you grind and the finishes you need.

***If anything*** can cut your grinding costs, it's greater *efficiency.* And if anything can bring you greater efficiency, it's this exhaustive Peninsular examination, and wheel recommendations based on the *facts* it brings out.

When may a Peninsular engineer call on you?

**The Peninsular Grinding Wheel Co.,** 729 Meldrum Avenue, Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

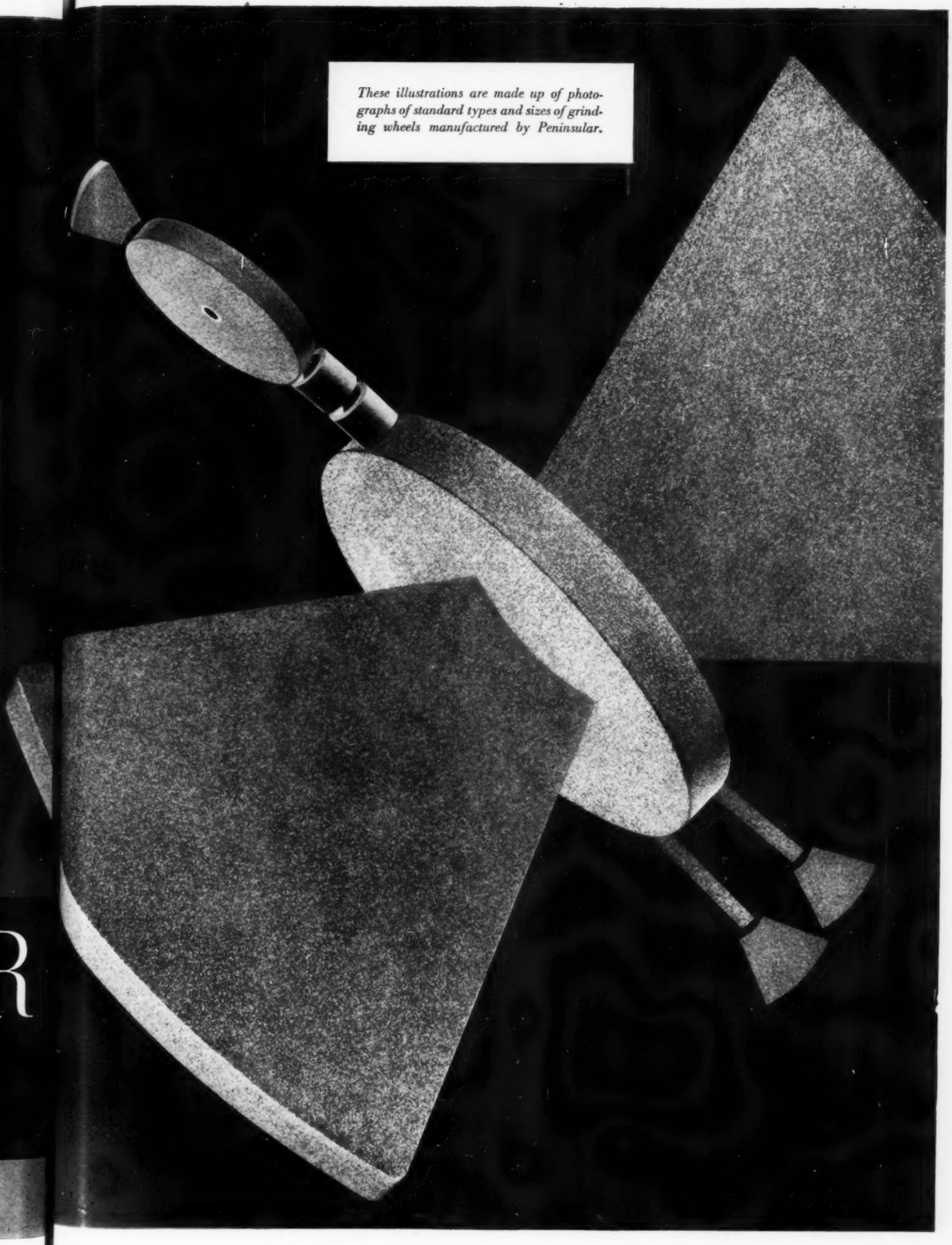
# PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

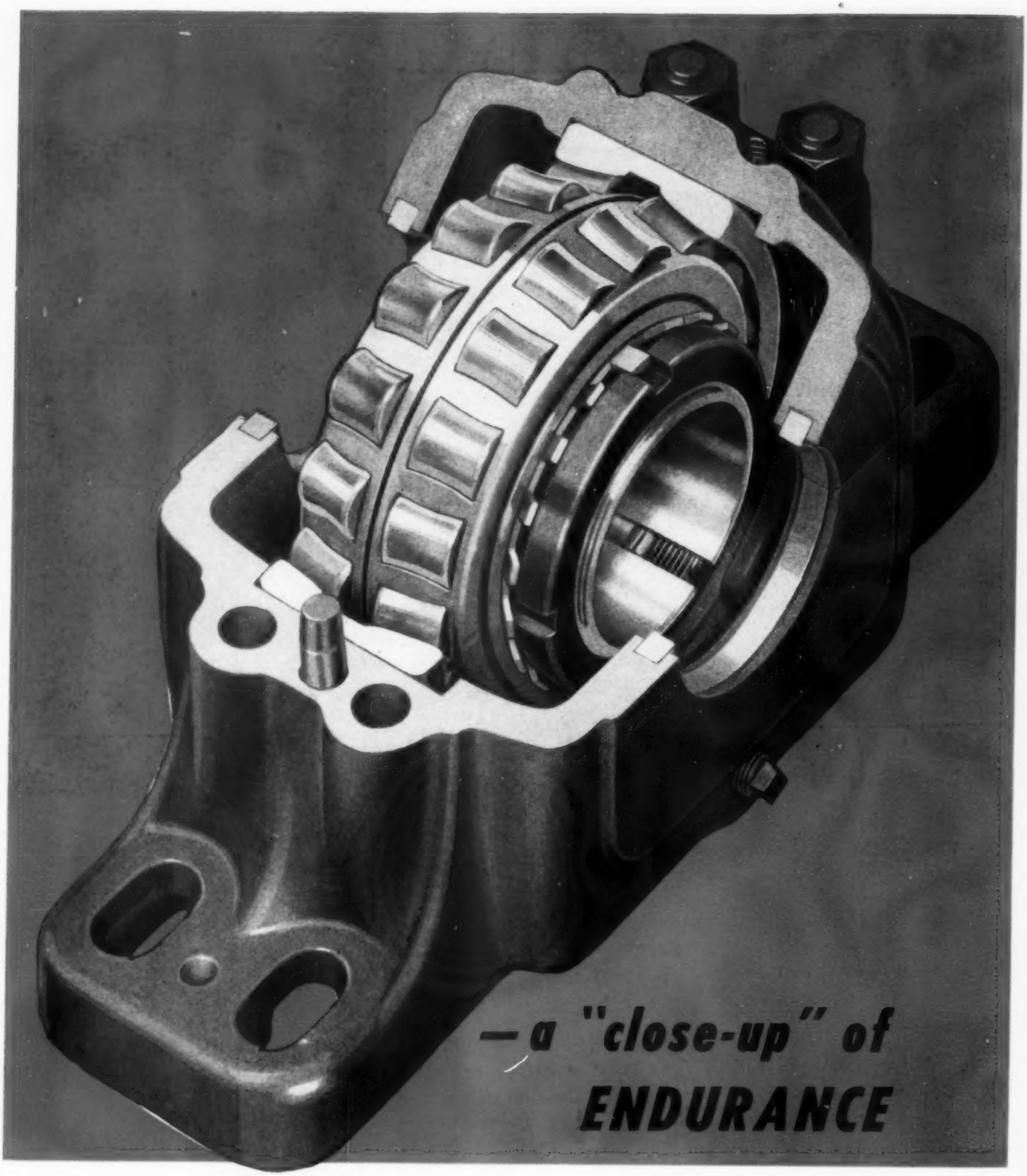
## GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



*These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.*



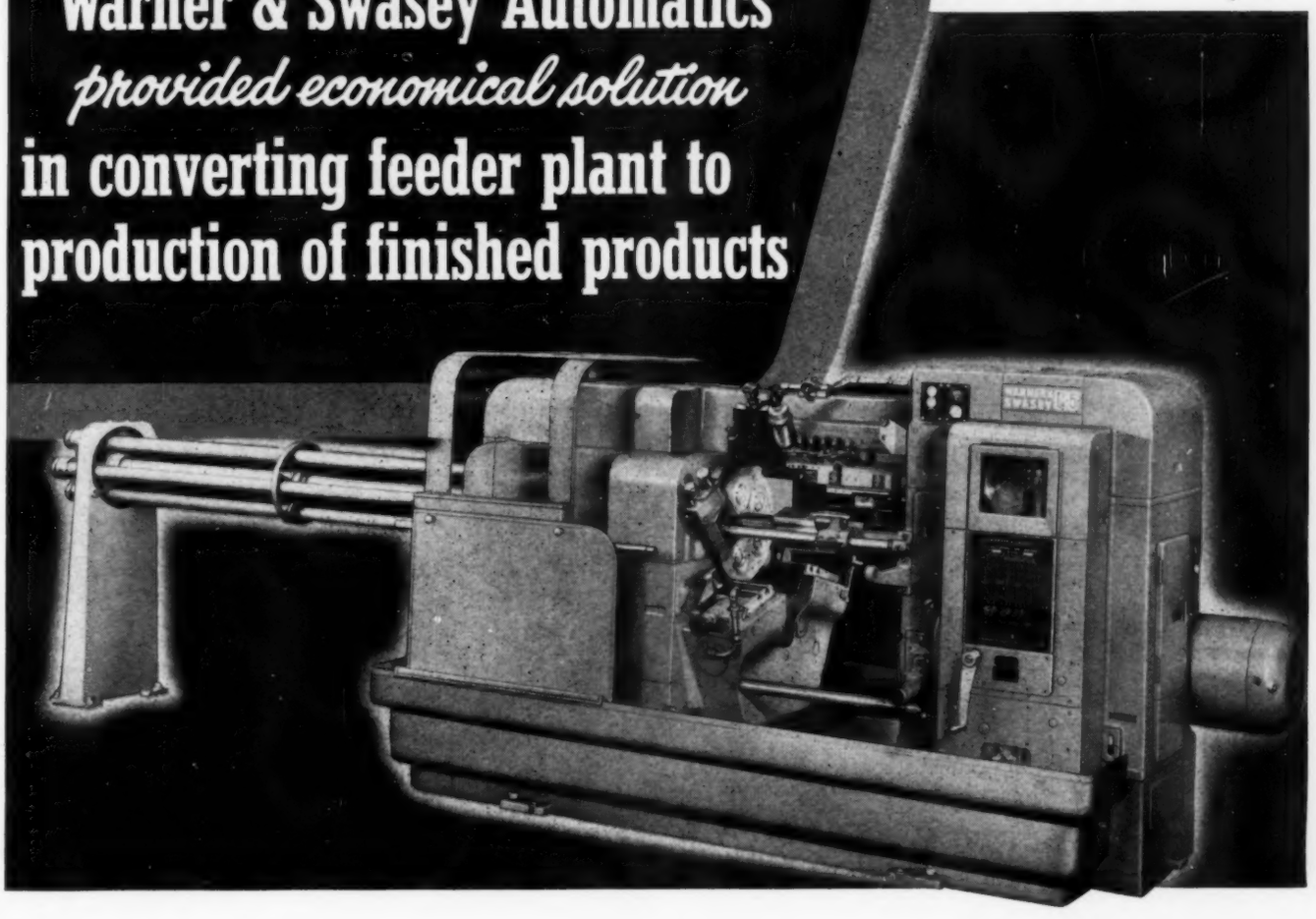

Good bearing design calls for combination of the ultimate in precision with ruggedness of construction. Link-Belt designers, who know the problems of power transmission best, have created a line of ball and roller bearings which will serve you well and longer. May we send catalogs?

11,287

**LINK-BELT COMPANY** Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.

**LINK-BELT** *Ball and Roller BEARINGS*

# Warner & Swasey Automatics *provided economical solution* in converting feeder plant to production of finished products



THE ROCKWELL MANUFACTURING COMPANY, Hopewell, N. J., had been making various small parts for gas regulators, meters, etc. They were suddenly faced with taking over complete production of finished items, plus valves and other precision fittings.

Management studied all factors – capacity and operational costs of existing equipment for handling the greater variety of big lot production—floor space availability—set-up requirements for job changes—capital investment for different type of proposed new equipment.

. . . the new 5-Spindle Warner & Swasey Camless Automatics, chucker and bar machines, they selected show these results:

- **Saved nearly 50% in capital investment**
- **Saved 332 sq. ft. of valuable floor space**
- **Saves power costs equivalent to 45 H. P.**
- **Saves almost 50% on operator's and set-up man's time**
- **Saves down time almost 25%**
- **Saves thousands of dollars on cutting tool reconditioning and replacement with elimination of secondary operations**

Why not learn how the new camless automatics can save costs—make money for your shop? Call the nearest Warner & Swasey office, or write—

It's simpler **to set up a Warner & Swasey CAMLESS Automatic!**

WARNER & SWASEY Machine Tools *Cleveland*

Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

# You Can Cut Surfacing Costs with NORTON DISCS

## *Because They Contain the Right Combination*

**Each of these surfacing jobs requires a disc with a different combination of abrasive, bond, grain, grade and structure. This combination must be right if the disc is to cut fast and cool, and to have a long, useful life.**

## *A Choice of Abrasives and Bonds*

When you specify NORTON Discs, you have a **choice** of abrasive, a **choice** of bond, and a **choice** of grain, grade and structure. This **freedom of choice** enables you to obtain a disc of exactly the right combination — a disc with all the properties required to give you a fast, cool cut and extra long life on each of your surfacing jobs.

## *Easy to Mount*

You'll find that NORTON Discs are easy to mount, too — no cementing is necessary — no return of plates for refilling.

## *Engineering Service*

Let a NORTON abrasive engineer study your disc grinding jobs. He'll take into consideration the type of disc grinder you're using, the material you're grinding, the size and shape of the work, the amount of stock to be removed, and the finish desired. Then he'll recommend a NORTON Disc of the **right combination.**

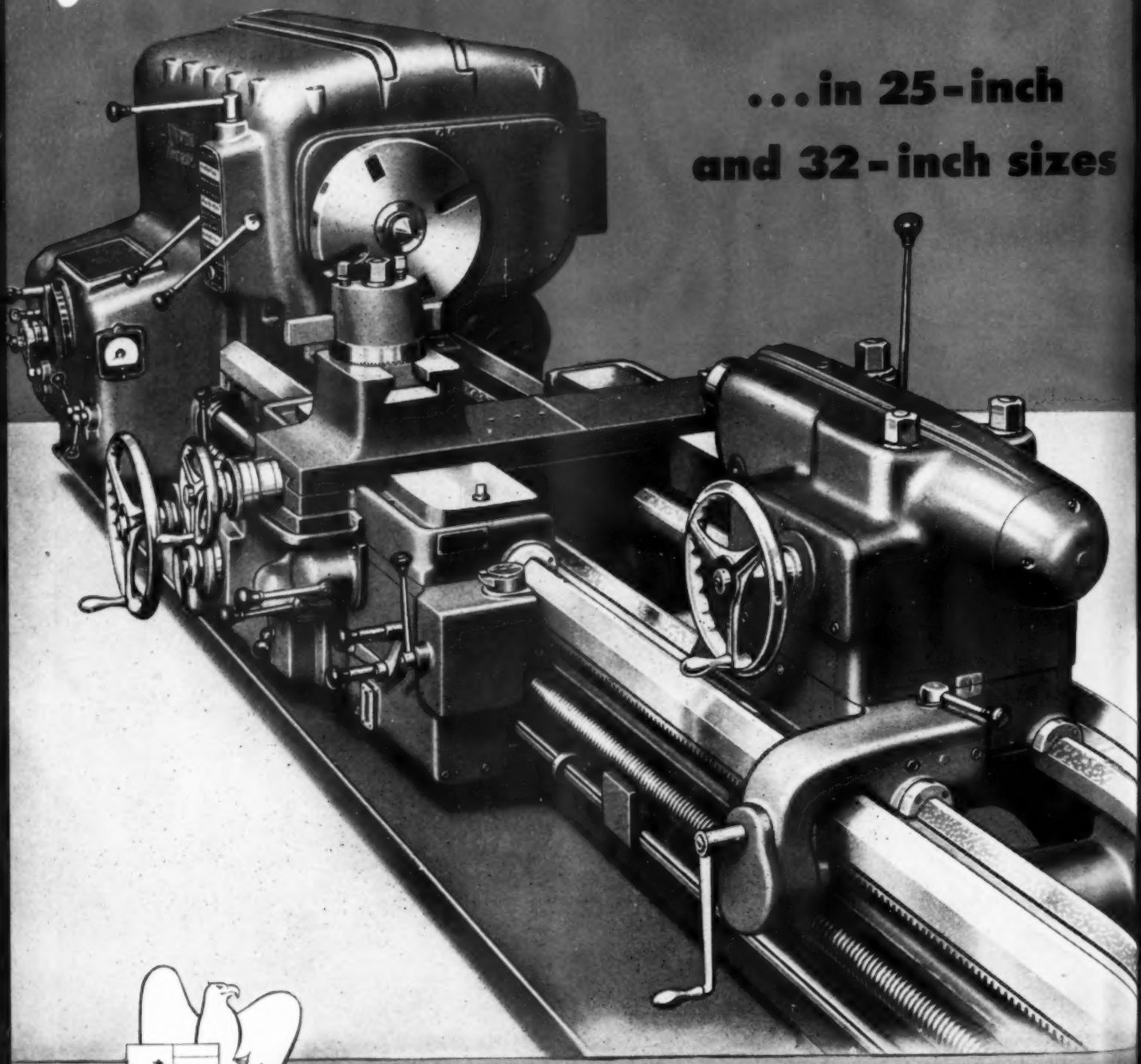
**NORTON COMPANY**
**Worcester 6, Mass.**
***Distributors in All Principal Cities***

**NORTON ABRASIVES**

*The Lathe of Tomorrow...*

# *Now- a New* PACEMAKER

**...in 25-inch and 32-inch sizes**



THE AMERICAN TOOL WORKS CO.

*at your Service Today!*

## HIGHLIGHTS OF PACEMAKER EXCELLENCE

1. Designed for full overload of 40 horse power motor.

2. Generously proportioned with metal correctly distributed to insure continuous service at maximum loads.

3. 27-speed head providing 100 to 1 ratio with speeds 6 to 600 RPM.

4. Spindle rigidity increased 16 times by center bearing. Front and center Timken Precision Bearing adjustable in thousandths from outside of head. The additional rigidity provided by the center bearing insures minimum spindle deflection under heavy stresses, thus maintaining pitch line contact of driving gears resulting in longer life of gears and bearings and freedom from excessive noise.

5. Entire machine automatically oiled; all gears hardened and ground or machine lapped; all shafts hardened and ground; spindle speeds, feeds and threads direct reading.

6. Machine started, stopped, braked, jogged and reversed electrically from convenient lever at right-hand side of apron.

7. Extremely massive bed designed to extrude chips through vents in rear wall.

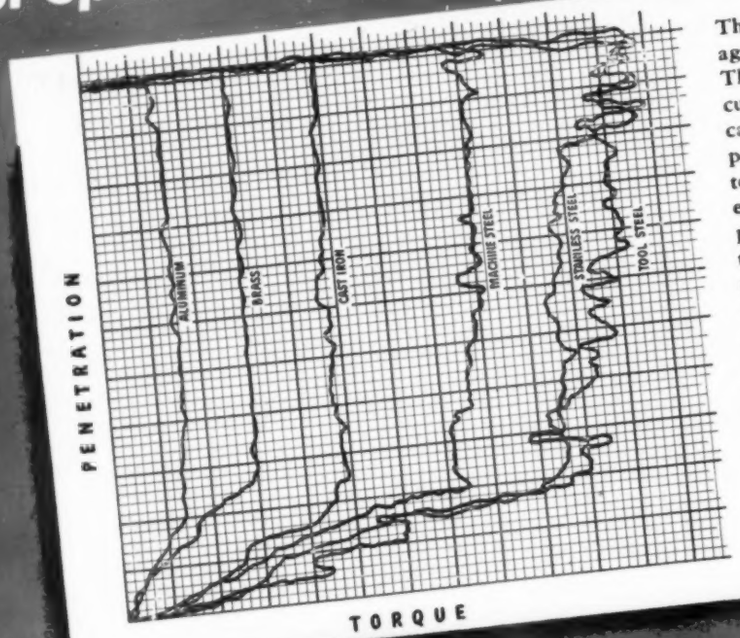
8. Get all the facts about this ultramodern superproductive lathe . . . send for Bulletin No. 25.

**Cincinnati, Ohio U.S.A.** LATHES AND RADIAL DRILLS

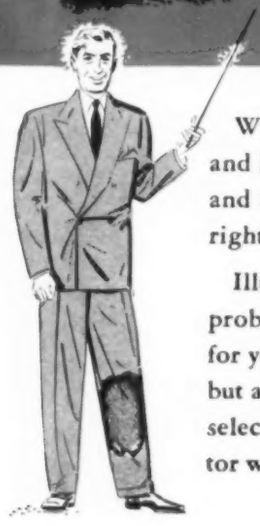
# Take your Tip from these Torque Tests

## (and many other MORSE Tests)

## for Special Purpose Drills that Thrive on Work!

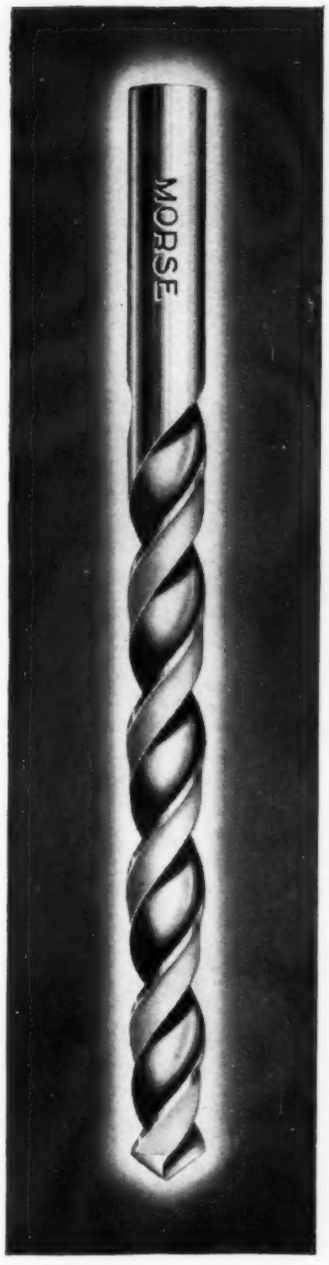



This chart shows drill penetration against torque in various metals. The curves are typical of a *series* of curves in similar tests. They indicate the performance of a special purpose drill as the design is altered for maximum cutting efficiency. Many "trial and error" tests preceded the one that produced the results shown and many other tests followed before the final design was approved. The high speed steel from which the drill is made, the helix angle, web thickness, heat treatment and angle of point are all variables that are studied and re-studied. This testing is typical of the continuous checking by the Morse Laboratory to develop drills that offer the best performance for special jobs.

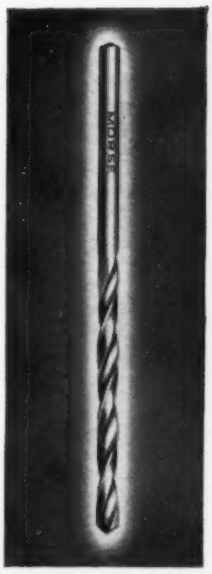


When *special* drilling problems prove troublesome, look to the Morse Laboratory and Morse engineering to meet the need in terms of *special purpose* drills. Morse skills and facilities *plus* long experience in the production of cutting tools that have proved right, is your assurance of the best working tool for *your* job.

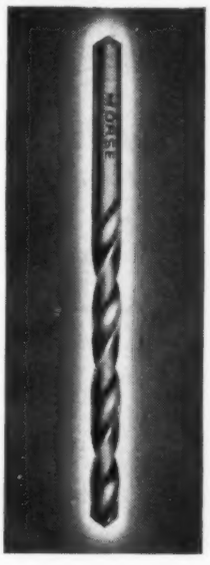
Illustrated are five special purpose drills that have supplied the answers to challenging problems by cutting *faster* and lasting *longer*. Perhaps one or more of them is designed for you. But remember, *your* production may vary enough to require seemingly similar but actually quite different specifications. That is why we say let Morse lend a hand in selecting the drill that will do the superior job for *you*. Your Industrial Supply Distributor will be glad to help.



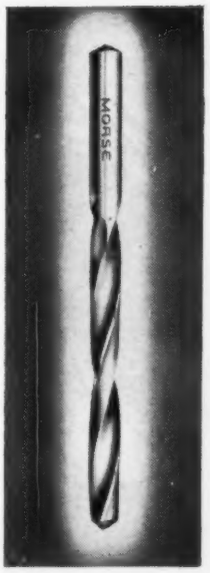

**MORSE Quick-Twist Drills (1363)** . . . for deep-hole drilling in aluminum, magnesium, die-cast metals; for slate, marble and certain plastics.



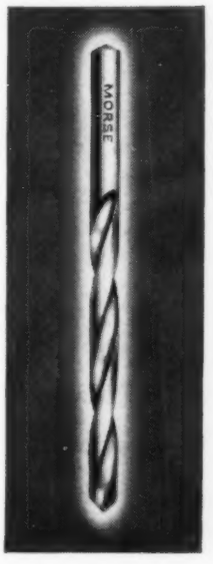

**MORSE Cotter-Pin Drills (1386)** . . . for skin metal, shallow-hole drilling, cotter-pin holes, steering arms, knuckles, gas burners and copper. Ideal in portable drills.




**MORSE Cobalt Drills (2330)** . . . for hard materials, can be run 25% faster. Used in rigid drill press with positive power drive capable of extreme point pressure.




**MORSE Brass Drills (1344)** Specially designed for work in brass. Made with wide grooves to clear chips easily. Special slow spiral.




**MORSE Bakelite Drills (1361)** . . . for Bakelite, Ebonite, asbestos, fibre, brass, hard rubber, various molded plastics. Withstands abrasion.

*Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture*

# MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

**New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.**

# "CARRY ON"

THE LIFE of any business is like a relay race. The business leader is the runner . . . when his race is run, he passes the baton to his teammate and the race goes on.

☆ Sound businesses are not tied to the life span of any one leader, they "carry on" no matter what individual may pass from the field. Basic is the rule that there must be another ready to grasp the baton.

☆ K. R. Wilson . . . the founder of this business has passed away. Within the organization he built are others who have come up to take his place. They will "carry on."

☆ The founder's monument — built over a period of thirty-two years — is the successful business he left as a small contribution to America's future. Mute testimony of this fact can be seen in the many thousands of KRW Hydraulic Presses being profitably operated by Industry today.

☆ Raised in these sound traditions, those who will carry on pledge to maintain the same high standards of quality, engineering and manufacture which they inherited. That, to us, is the best way we know to say good-bye to "The Boss."

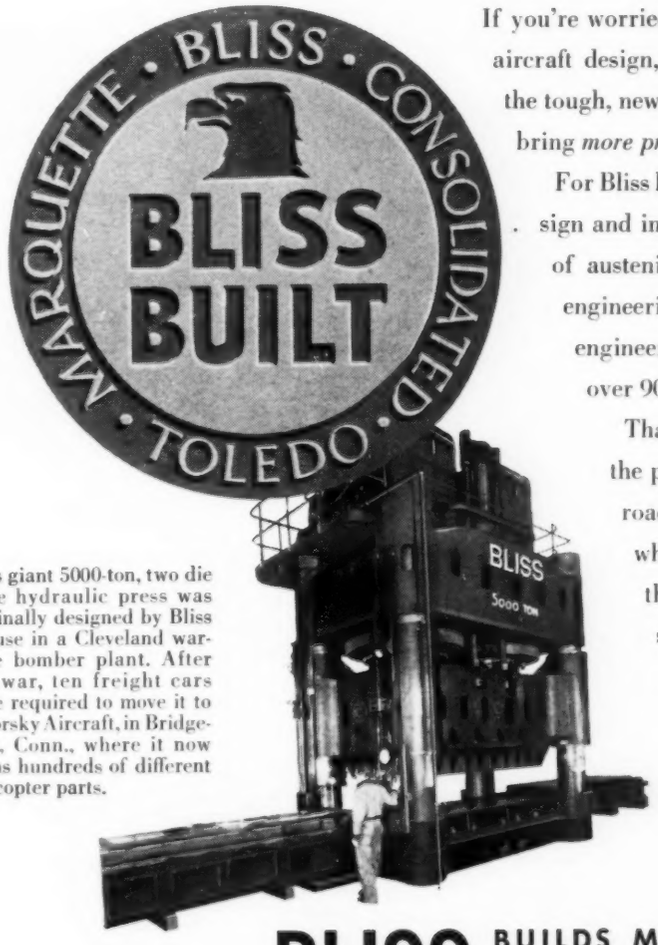
*The Management Group*

**K·R·WILSON**

WORLD'S LARGEST MANUFACTURER
OF GARAGE TOOLS AND EQUIPMENT
**215 MAIN STREET . . . BUFFALO 3, N. Y.**

Forerunners of airplanes that will soon consistently crack the sonic wall are these jets—here rocket-assisted to speedy take-off.

# More Press Power to you




This giant 5000-ton, two die slide hydraulic press was originally designed by Bliss for use in a Cleveland wartime bomber plant. After the war, ten freight cars were required to move it to Sikorsky Aircraft, in Bridgeport, Conn., where it now forms hundreds of different helicopter parts.

If you're worried about the "producibility" of your aircraft design, Bliss engineers can help. To match the tough, new alloys, they offer the proven ability to bring *more press power* to you.

For Bliss has never hesitated to pioneer in press design and improvement. They will meet the challenge of austenitic steels and other alloys with advanced engineering techniques and a fund of development engineering knowledge and experience that goes back over 90 years.

That's why Bliss presses predominate throughout the pressed metal field, the aircraft, automotive, railroad, electrical, and many other industries...that's why presses for the toughest jobs are *Bliss-built*... that's why your problem will be nearer solution by sending for a Bliss sales engineer today.

**See our Catalog in Sweets or write for Bulletin 35-B**

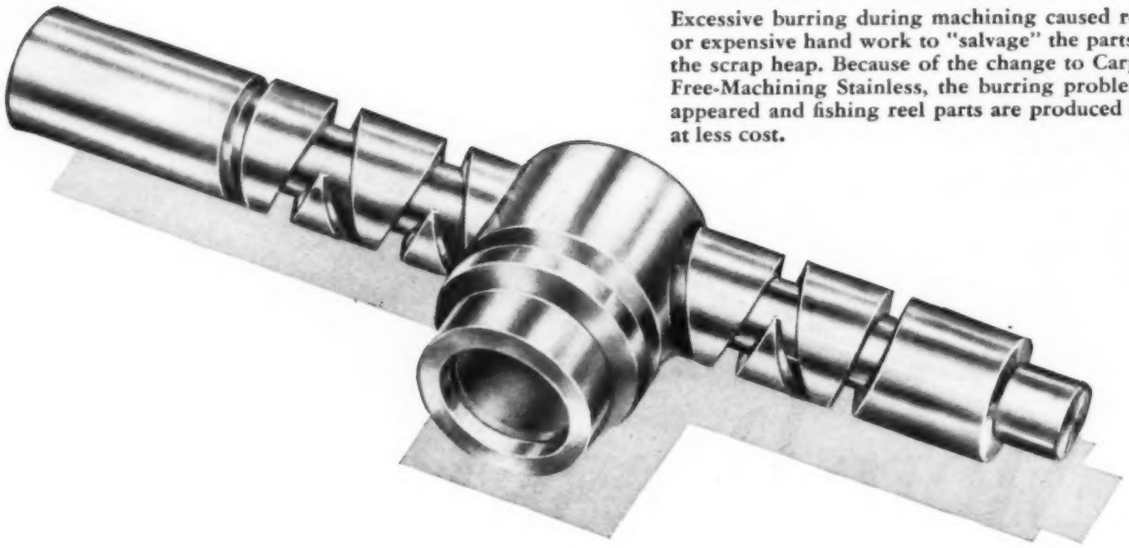
**E. W. BLISS COMPANY, DETROIT 2, MICHIGAN**

*Mechanical & Hydraulic Presses, Rolling Mills, Container Machinery*

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France.

**BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD**

# When You Want New Ways to



**NO MORE COSTLY HAND WORK...**

Excessive burring during machining caused rejects, or expensive hand work to "salvage" the parts from the scrap heap. Because of the change to Carpenter Free-Machining Stainless, the burring problem disappeared and fishing reel parts are produced faster, at less cost.

**You Can Turn It Out**
**AT LESS COST**
**with Carpenter Free-Machining Stainless!**

The cost of the steel you buy is only a fraction of the cost of the finished products made from Stainless. To get a lower *unit* cost for every Stainless part you make, take advantage of the help that Carpenter can give you.

**UNIT COST: 5¢**

Production slow—rejects excessive and unit costs "impossible" until Carpenter Stainless No. 8 (Type 304) was used for making this bearing race. Unit cost is now only 5¢...tool life has more than doubled and rejects have dropped 40%.

**WHEN YOU WANT *Rush* DELIVERY CALL YOUR *Carpenter* WAREHOUSE -**

| | | | |
|---|---|---|---|
| BOSTON | CINCINNATI | HARTFORD | PHILADELPHIA |
| BRIDGEPORT, CONN. | CLEVELAND | INDIANAPOLIS | PROVIDENCE |
| BUFFALO | DAYTON | LOS ANGELES | ST. LOUIS |
| CHICAGO | DETROIT | NEW YORK | WORCESTER, MASS. |

*SEE THE CLASSIFIED SECTION OF YOUR TELEPHONE DIRECTORY*

# REDUCE MACHINING COSTS on STAINLESS Jobs

## —use this *Carpenter* help!

Our help starts with the *uniformity* of the free-machining Stainless you buy from your Carpenter warehouse. Every lot machines the same, to the finish you want.

Next, Carpenter's STAINLESS MACHINING "NOTEBOOK" gives correct information on speeds, feeds, tooling, etc. for all types of jobs. Each chapter contains a Check Chart that lists common "trouble spots" and gives shop tips on how to cure them. Many plants have reported better results and reduced costs after putting this information to work. For your personal copy of the Carpenter "Notebook on Machining Stainless Steels", send us a note on your company letterhead, indicating your title, please. Extra copies of the NOTEBOOK, for the men in your shop, are available at 50¢ each.

Using Carpenter's SHOP HELP ON NEW JOBS is another way to bring down the cost of working with Stainless, where special requirements and extremely close tolerances are important. Combine your nearby Carpenter representative's experience with easy-to-work Carpenter Stainless bars, and you have a large part of the answer to low cost machining on your Stainless jobs. To put that experience to work in your plant—at a saving—get in touch with the nearest Carpenter office listed below.

**MORE PARTS PER DAY . . .**

Actual time records show an increased number of parts per day, flawless finishes and longer tool life now that Carpenter Stainless No. 8 (Type 303) is used for these corrosion-resistant valve needles.

**TOTAL TOLERANCE .0005″**

And a hole is reamed (without grinding) to minus .0000″, plus .0002″ for this spiral gear. Even if you do not work to tolerances such as these, the job is a good example of what *can* be done—at a profit—when you use Carpenter Free-Machining Stainless.

more than corrosion resistance

**THE CARPENTER STEEL COMPANY, 109 West Bern Street, Reading, Pa.**

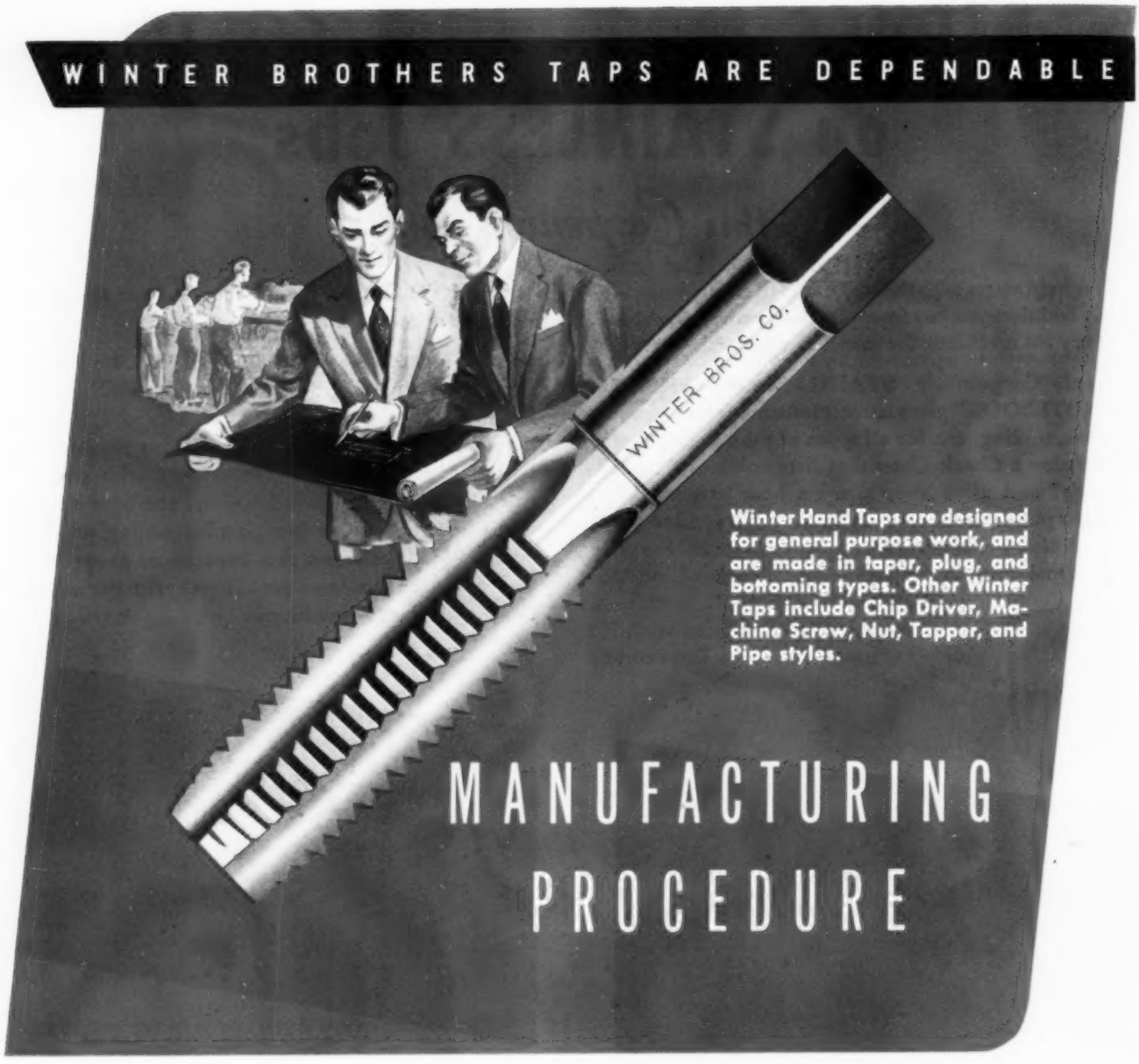
Export Department: 233 Broadway
New York 7, N.Y."CARSTEELCO"

*Carpenter*

**FREE-MACHINING**

**STAINLESS STEELS**

# WINTER BROTHERS TAPS ARE DEPENDABLE




Winter Hand Taps are designed for general purpose work, and are made in taper, plug, and bottoming types. Other Winter Taps include Chip Driver, Machine Screw, Nut, Tapper, and Pipe styles.

## MANUFACTURING PROCEDURE

More than modern equipment and good materials are needed to make taps of Winter dependability. Equally critical is the ability to combine the various manufacturing steps into one efficient whole. Winter engineers have more than 47 years' experience in tool design and manufacture. This engineering knowledge, combined with the facilities of a new and modern plant, helps build dependability into Winter Taps and Dies.

*Always at Your Service*

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter Taps on his shelves—as close to your tapping problems as the telephone on your desk.

**Winter Brothers COMPANY**

ROCHESTER, MICHIGAN, U.S.A. • Distributors in Principal Cities • A Division of the National Twist Drill and Tool Company • Branch Stores: New York, Detroit, Chicago, San Francisco

WINTER

PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

# SELECTION OF RAW MATERIALS

National makes a complete line of standard and special Reamers, including taper and chucking Reamers in high speed and carbon steel, and shell types in high speed steel only. Other National tools include Twist Drills, Counterbores, Milling Cutters, Hobs, and End Mills.

*Call Your Distributor*

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

Every bit of steel that goes into National Cutting Tools is rigidly inspected and tested. At the same time, National conducts its own research into the properties of new steels as fast as they are developed. For example, the qualities of hardness and toughness, as related to tool life, are special subjects of National's raw material studies at all times. Methods like these build better performance into National Cutting Tools.

**NATIONAL TWIST DRILL AND TOOL COMPANY**

**ROCHESTER, MICHIGAN, U. S. A.** Tap and Die Division—Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

# ARMSTRONG

## ARMSTRONG TOOL HOLDERS

**answer both . . .**

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tiped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

*Stocked by Leading Tool Departments*

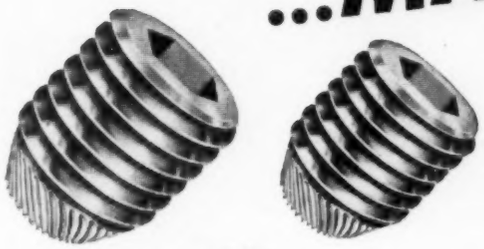
**ARMSTRONG BROS. TOOL CO.**

*"THE TOOL HOLDER PEOPLE"*

5215 W. Armstrong Ave. Chicago 30, U.S.A.

*New York and San Francisco*

# ...MANY MILLIONS *in use*



UNBRAKO

Reg. U.S. Pat. Off.

Pat'd & Pats. Pending

# *SELF-LOCKING*
# SOCKET SET SCREWS

The KNURLED cup point of this popular "Unbrako" Socket Set Screw makes it a Self-Locker . . . because the keen edges of the counter-clock-wise KNURLS prevent creep, regardless of the most chattering vibration. A real fastener, if ever there was one . . . it positively *won't shake loose!* Sizes available from #4 to 1½" diameter, in a full range of lengths.

**Write us for the name and address of your nearest "Unbrako" Industrial Distributor and your copy of the "Unbrako" Catalog.**

**"UNBRAKO" SOCKET HEAD STRIPPER BOLT WITH KNURLED HEAD**

Knurling of the head of the "Unbrako" Socket Head Stripper Bolt allows for fumble-proof grip—even if fingers and head are oily—thus, materially speeding production.

**"UNBRAKO" SOCKET SET SCREW WITH KNURLED THREADS**

**"Won't Shake Loose"**

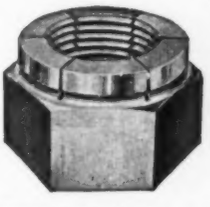
The Knurling of this "Unbrako" Socket Set Screw—as shown—"swages" the threads, so that it becomes a most excellent Self-Locker—for use where the 5 standard points do not lend themselves to knurling.

**Knurling of Socket Screws originated with "Unbrako" in 1934.**

**"HALLOWELL" STEEL COLLARS**

"Hallowell" Solid Steel Collars are functionally proportioned throughout, highly polished all over and run true as a die. 3" bore and smaller are made from Solid Bar Stock and fitted with the famous "Unbrako" Knurled Point Self-Locking Socket Set Screw. Available in sizes from 3/16" to 3". Immediate Delivery.

**"FLEXLOC" SELF-LOCKING NUTS**



**"Won't Shake Loose"**

The one-piece, all-metal, full-thread, resilient "Flexloc" Lock Nut is becoming widely accepted, because it is processed to have an exceptionally uniform torque . . . and because it is a stop, a lock and a plain nut ALL IN ONE. Sizes from #6 to 2" diameter, in REGULAR and THIN types—in NC and NF thread series.

**"HALLOWELL" KEY KIT**

You can't tighten or loosen socket screws without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all socket hex bits.

Kits: Pats. Pend.

★ PAT'D. & PATS. PEND.

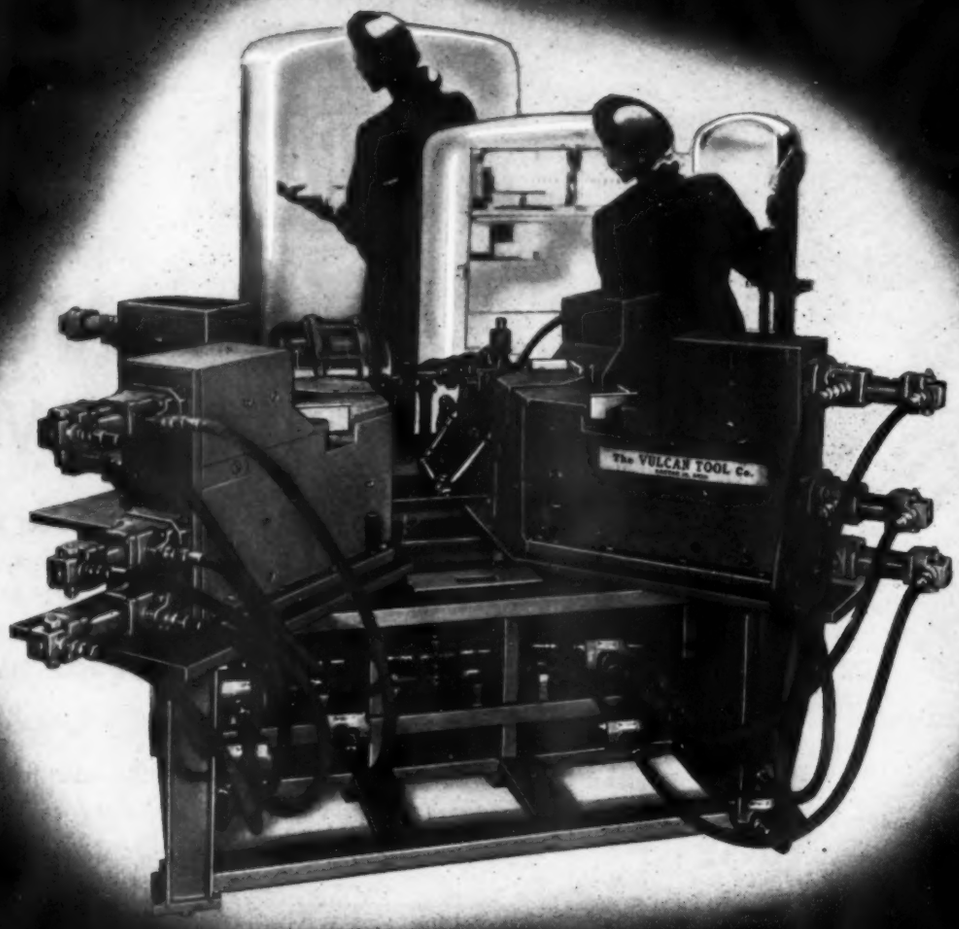
**OVER 45 YEARS IN BUSINESS**

## STANDARD PRESSED STEEL CO.

**JENKINTOWN, PENNSYLVANIA BOX 4**

**BRANCHES: CHICAGO DETROIT INDIANAPOLIS ST. LOUIS SAN FRANCISCO**

**4 CORNERS**
formed every
**7 SECONDS**




# Hydraulic Corner Forming Unit

speeds refrigerator food compartment liner production

Forms 4 corners simultaneously

Saves man hours

Saves floor space

For example, common practice was to blank and form one corner at a time, weld, and then metal finish. Dies were expensive, so was finishing department labor. With Vulcan's Hydraulic and electrically controlled Forming Unit all four (4) corners are formed at the same time every seven (7) seconds. One operator. No punch presses needed.

Let's talk about special tools and machinery for speeding your production. For better acquaintance ask for Vulcan Equipment List.

**Vulcan Tool Co.**
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

*What's in*
VERMONT
*this month?*

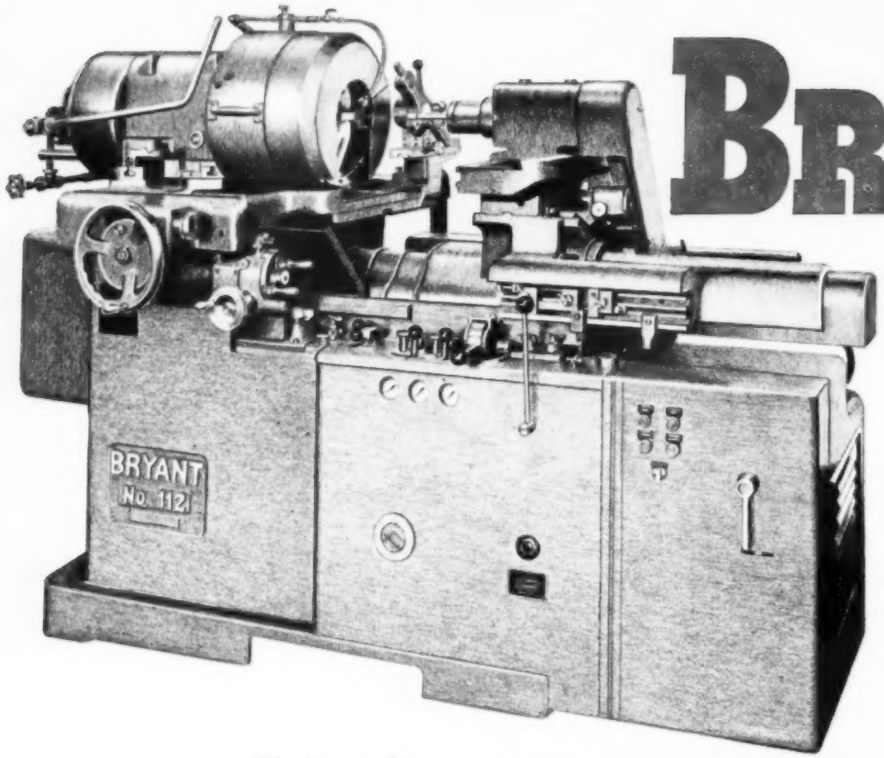
**NOW, INTERCHANGEABLE GLASS PARTS THROUGH INTERNAL GRINDING.** A standard machine tool designed for metalworking was recently put to work in a glass factory. This in itself is not startling, but it illustrates the new and progressive thinking of production men —thinking that is paying off throughout industry.

In this glass factory the old operation sequence consisted of rough lapping taper holes on cast iron laps; finish lapping male and female parts together as an assembly, then continuing these two parts through production to be shipped as a unit. Imperfection of one part meant scrapping both parts.

A Bryant No. 112 internal grinder was put on the line. "As cast" or blown parts are chucked and then ground with a diamond wheel. In a matter of seconds the taper hole is ground so that it will "blue" a plug. The operator checks the piece in the machine and sends the part on. No mating is needed, as all holes are made to a standard and are interchangeable. Actual figures show that the new method is faster and cheaper and, at the same time, the final product is greatly improved because of the interchangeability feature.

This is an example of how well-established metalworking production methods can be applied to other industries. Bryant equipment grinds hole, O.D., and face, singly or in combination, in a single chucking. It won't cost to inquire.

**Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.**




# BRYANT

## Number 112

## HYDRAULIC INTERNAL GRINDER

*The Bryant No. 112 is a general purpose internal grinder for production work, yet with all the features necessary for quick changeover, with minimum effort, for tool room jobs. Other Bryant equipment will grind work through the complete range up to 60 inches in diameter. Write to the factory for full information.*

### SPECIFICATIONS

| | |
|---|---|
| Total swing | 16 inches |
| Maximum traverse | 20 inches |
| Maximum hole depth | 8 inches |
| Will grind included angle | 90° |
| R.P.M. of work spindle | 100 to 1,000 R.P.M. |
| Net weight | 5,500 lbs. |
| Floor space — 90 inches x 60 inches (with coolant tank) | |

**SLIDES**
Wheelhead on Bryant cylindrical slide base; workhead (for cross feed) on anti-friction bearings.

**WORKHEAD**
Precision ball bearing spindle. Infinitely variable and reversible spindle by hydraulic motor. Standard cam lock spindle nose.

**WHEELHEAD**
Interchangeable quill type, belt driven, anti-friction bearings; will use Hi-Frequency Wheelhead for 100,000 R.P.M.

**TRAVERSE**
Infinitely variable, hydraulically powered.

**CROSS FEED**
Variable speed automatic feed. Precision feed graduated in .0001" increments.

**THE BRYANT SQUARENESS-OF-FACE GAGE** not only shows acceptability of threaded parts, but also visually indicates the right angularity of the face with the pitch diameter of the thread. The squareness-of-face gage may be mounted on any Bryant bench gage.

### You can *"See the Difference"* with a BRYANT GAGE

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

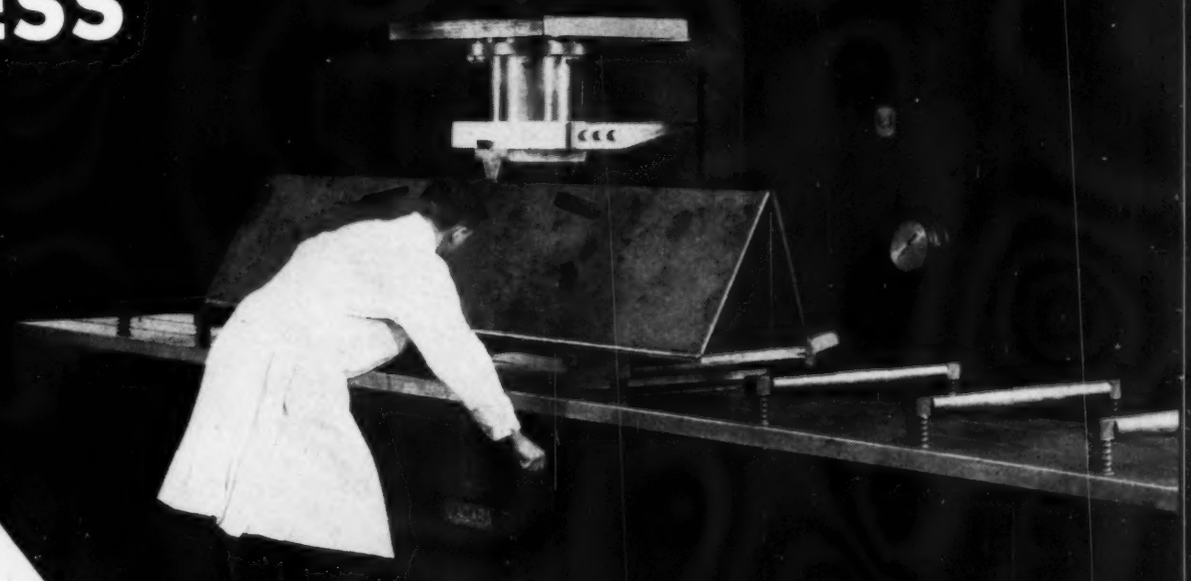
Send samples or drawings for a complete story on how Bryant can save inspection money for you.

**Bryant Chucking Grinder Co., Springfield, Vermont, U.S.A.**

# Announcing

# NIAGARA

## HYDRAULIC PRESS



*for*

BENDING
FORMING
DRAWING
ASSEMBLING
STRAIGHTENING
PUSH BROACHING
METAL FABRICATION

## AN ACHIEVEMENT *in Modern Design*

Hydro-Touch Control . . . Both the approach speed of the ram and the applied pressure of the ram are controlled through the movement of one lever and are obtained in proportion to the displacement of that lever.

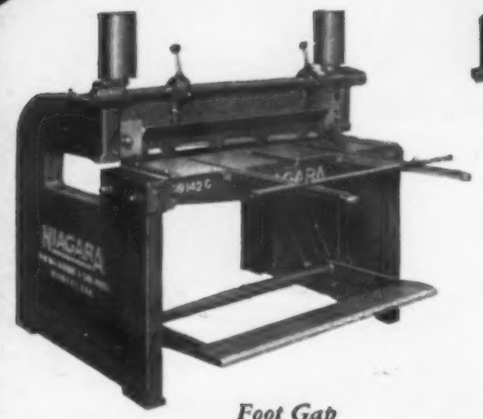
- Totally submerged Hydraulic System
- One-piece welded construction
- Wide versatility
- Write for Catalog 84

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.
DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

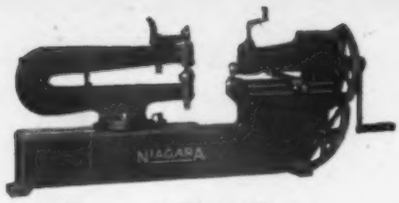
# NIAGA

*Everything from*

## TINNERS TOOLS *to* F



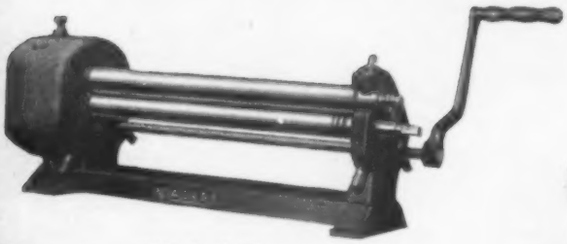

*Foot Gap Shear*




*Ring and Circle Shear*

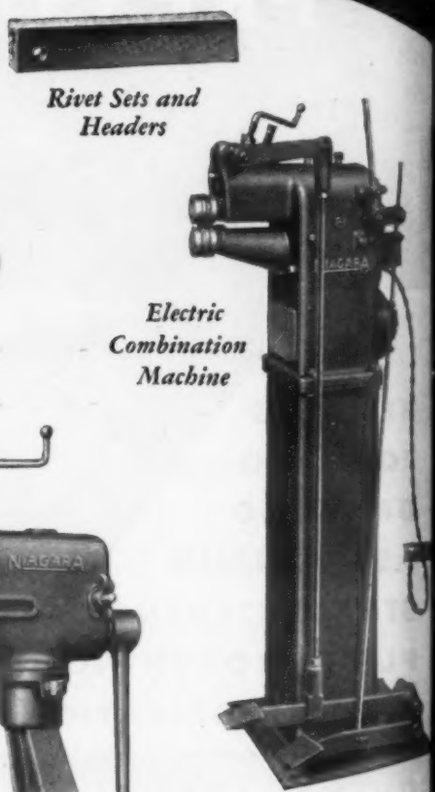
*Snips*

*Hollow Punches*



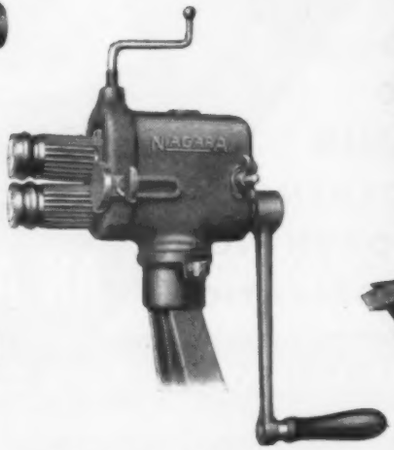
*Slip Roll Former*

*Hand Groovers*




*Rivet Sets and Headers*

*Electric Combination Machine*




*Crimper and Beader*

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N.Y.

# NIAGARA

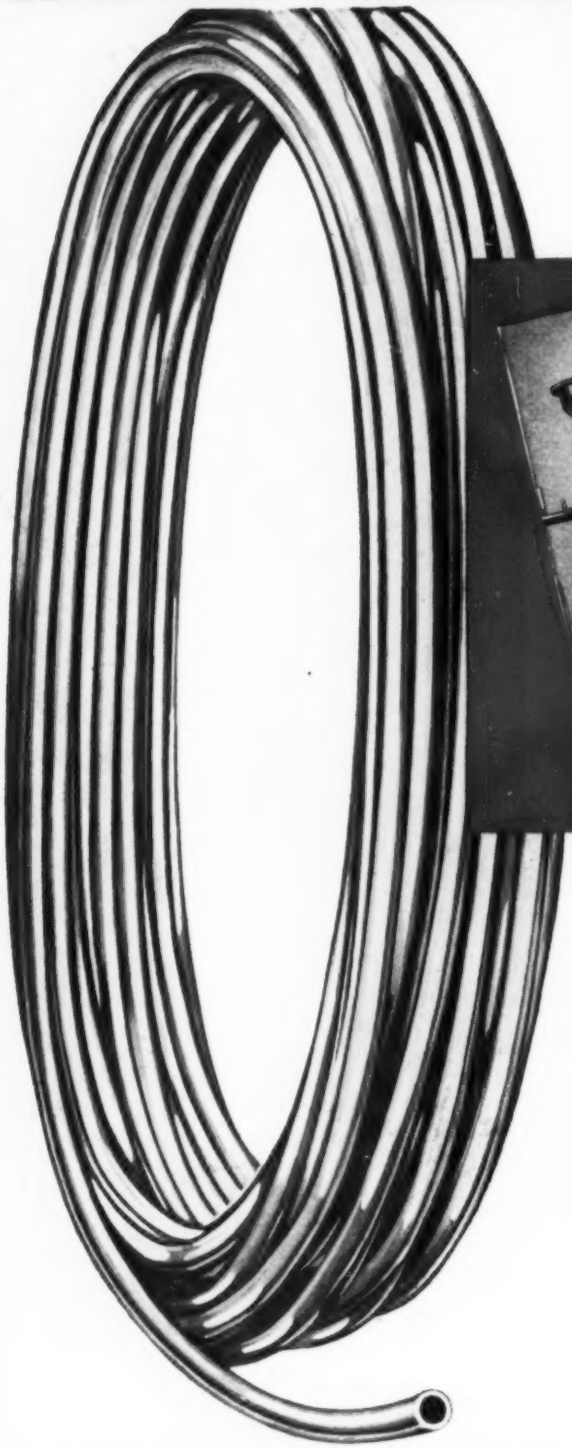
## POWER PRESSES *and* SHEARS

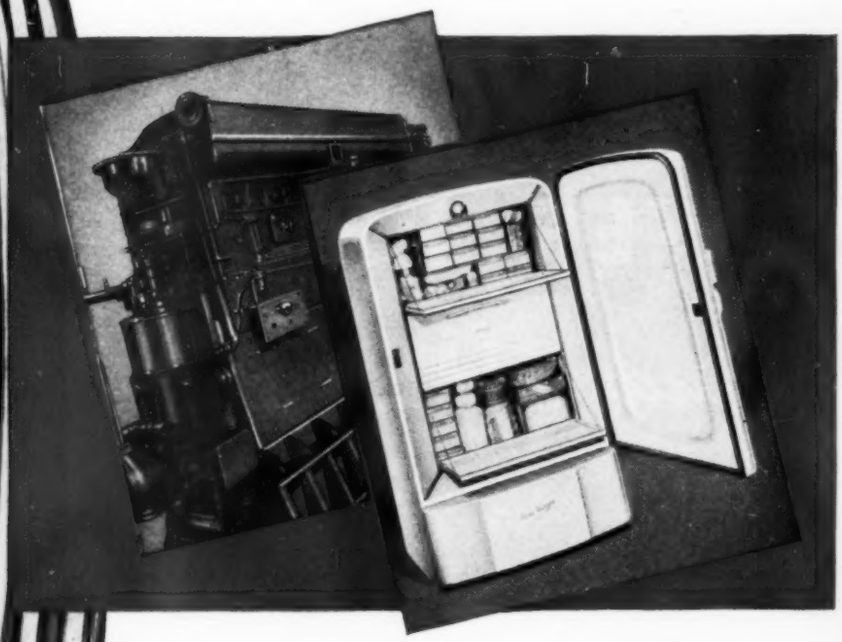
● Niagara offers America's most complete line of tinner's tools, machines, power presses and shears for production and maintenance. Illustrations on these pages show how they range from items as simple as a rivet set up to heavy presses and power squaring shears. Whether you require hand, foot or power operated equipment, — you get the best when you specify Niagara. Write for catalogs.

Y. DISTRICT OFFICES: • NEW YORK • CLEVELAND • DETROIT

# ECONOMICAL TUBING

## DIESELS TO FREEZERS





High-pressure fuel lines for a big diesel . . . or small evaporator tubing for a home freezer . . . both cost less when cut from a coil of Alcoa Aluminum Tubing.

Non-sludging in one case, high heat conductivity in the second, Alcoa Aluminum Tubing is the choice both on performance and price!

**Aluminum tubing is highly resistant to corrosion by many liquids, gases, and refrigerants. Has high strength, yet is easy to form and flare.**

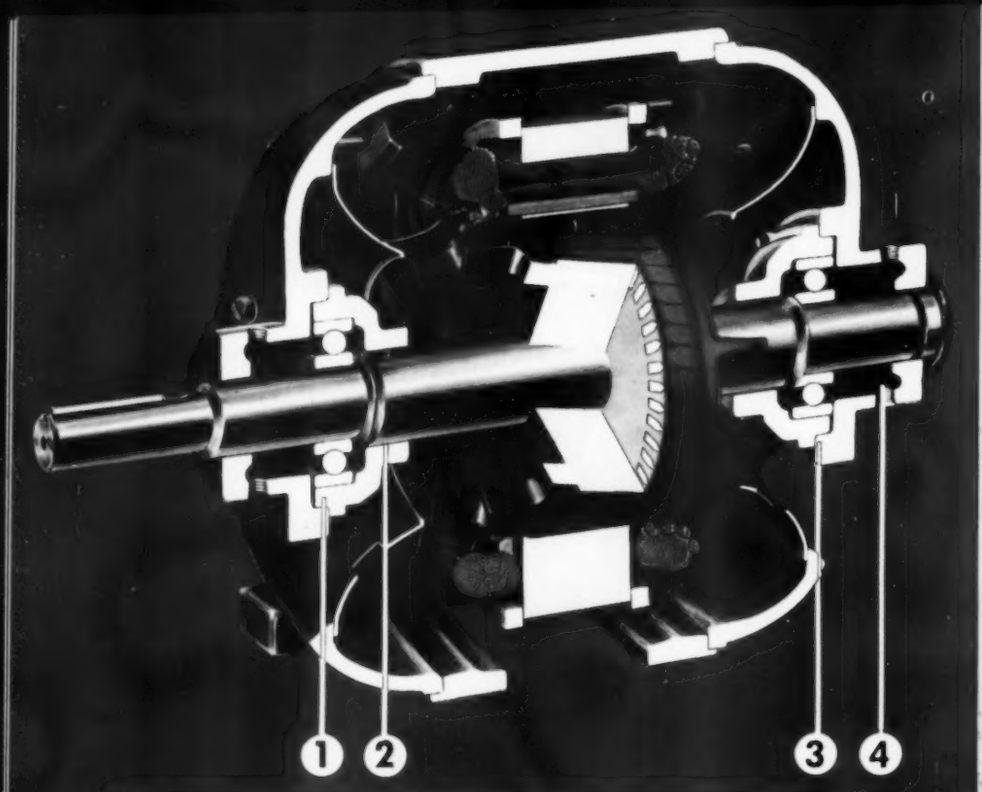
For information about the availability of Alcoa Aluminum Tubing, its economic advantages, and applications in your industry, call your nearby Alcoa Sales Office, or write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.
Sales offices in 55 leading cities.

ALCOA

ALUMINUM

# ALCOA *Aluminum* TUBING

YOU CAN'T BEAT A
TRI/CLAD MOTOR FOR
EASY MAINTENANCE
GENERAL ELECTRIC
HERE'S
WHY




Notice (1) how Tri-Clad bearings are surrounded by and rigidly supported in solid cast-iron housings. Compare the long, close-running fit between housing and shaft (2) with other motor bearings. Examine the tight rabbet fit between inner cap and end shield (3) which keeps dust and moisture out and lubricant in. See, too, the pressure-relief greasing system (4) that makes it easy to lubricate if you need to.

# You can't beat a TRI CLAD motor for easy maintenance

**A TRI-CLAD MOTOR** will run safely without lubrication for years—for as long as any other general-purpose motor you can buy. The big thing is—it's *grease-gun easy* to lubricate a Tri-Clad if you need to.

You don't have to take a Tri-Clad motor down and disassemble the bearings to lubricate it. You don't have to follow special instructions. A standard gun and a good grease are all you need.

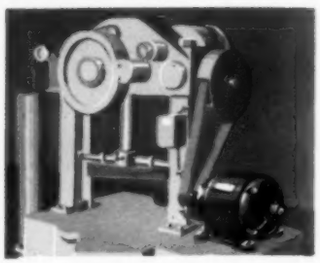
And remember, Tri-Clad gives you all the extra protection that only cast-iron structure can give . . . Extra protection against rust and corrosion . . . Extra protection against mechanical abuse and permanent distortion . . .

*Extra protection that has been proved in more than 5 billion hours of rough-and-tumble industrial service.*

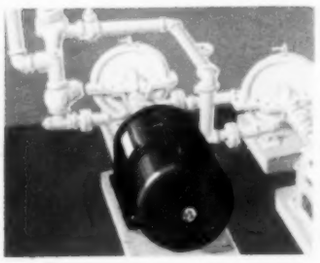
**WANT TO SEE FOR YOURSELF?** Tri-Clad motors in nearly all types and ratings are ready for **IMMEDIATE SHIPMENT.** Contact your nearest G-E Office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

## There's a Tri-Clad motor for every industrial need!



**G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.**



**G-E totally enclosed motors for operation where dust or corrosive fumes are a hazard. From 1 to 1000 hp.**

**G-E capacitor motors for use on fans, blowers, pumps and compressors with single-phase power. From ¾ to 5 hp.**

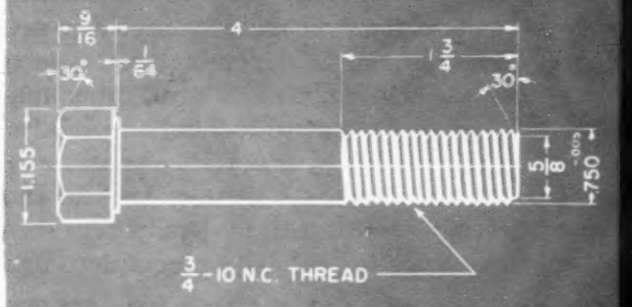
**G-E Type ACA induction motors for adjustable speeds—provide 3 to 1 speed range. From 3 to 200 hp.**

YOU CAN'T BEAT TRI CLAD

EXTRA PROTECTION

# YOU CAN CUT YOUR TURNING COSTS

## if your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively




*for instance . . .*

*Here is a typical example of the effective use of Carbide Cutting Tools on a Jones & Lamson #3 Ram Type Turret Lathe. This cap screw is completely machined from SAE X-1335 bar stock in 1 minute. The turning cut, taken at 1500 RPM (Approx. 450 SFM) with .015" FEED, requires in excess of 16 HORSE-POWER. Depth of cut is .205".*

*Send for our folder "One A Minute" which describes this operation in detail, and contains vital information for anyone contemplating the purchase of a Turret Lathe, or wishing to better his turning operations.*

**YOU CANNOT COMPETE with production like this with machines less powerful, less rigid. Jones & Lamson Turret Lathes guarantee your investment. They anticipate the future in metal turning. They are built with great reserves of ruggedness. They are powered to meet even more than today's requirements for the effective use of carbide tools. Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.**

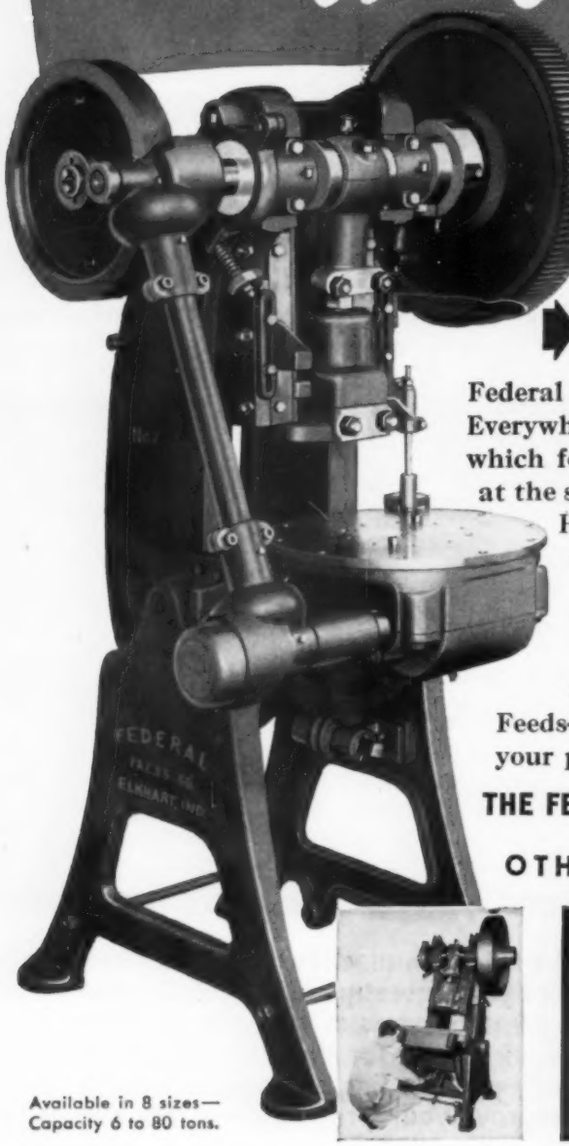
**JONES & LAMSON MACHINE COMPANY**
**Springfield, Vermont, U. S. A.**

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

# Jones & Lamson Lathes

## ARE POWERED FOR CARBIDE

# THESE *dial feed* PRESSES



## ➧ STEP UP PRODUCTION 3 TO 6 TIMES

## ➧ CUT COSTS AS MUCH AS 75%

## ➧ MAKE HIGH SPEED OPERATION SAFE

**Federal Dial Feeds are known for fast, safe, smooth operation. Everywhere you'll find them producing scores of special items which formerly required special machinery of limited utility—at the same time increasing production as much as 3 to 6 times! High speed, accuracy and reduced maintenance can save up to 75% in production costs depending on type of work. These presses can be indexed to give either long or short dwell of the dial. Positive locking mechanism smooths out the dial action (cannot skip or coast by station), adding to safety of the operator. Federal Dial Feeds—built to stand up under hardest usage—may help solve your production problem. Write for catalog on complete line.**

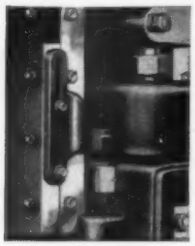
**THE FEDERAL PRESS CO., 440 DIVISION ST., ELKHART, IND.—TEL. 2831**

### OTHER FEDERAL COST-CUTTING FEATURES

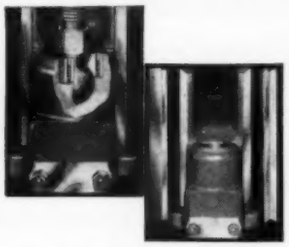
Available in 8 sizes—Capacity 6 to 80 tons.



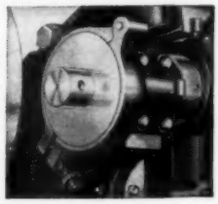
All Federal Presses may be reclined from the front—adjustment made quickly and easily by one man. Lock bolts hold press in desired position.



Knockout bracket is anchored to frame. Result: no danger of misalignment due to knockout bar impact. This reduces time out for adjustment, cuts costs.



The ram on Federal Presses is symmetrical, giving equal distribution of weight and balance; it is bored in exact alignment with "V" ways. Such careful construction adds to accuracy, speed and efficiency of press.



Shock from thrust and return strokes is transmitted to frame—no strain on bearings and caps. Brakes (spring tension) are quickly, easily adjusted.

# FEDERAL *Dial Feed* PRESSES

# Decidedly FINER!

## OUTSTANDING VALUE *in the* MEDIUM-PRICE FIELD

TIMKEN BEARINGS ON ALL SHAFTS IN HEADSTOCK

•

OVERSIZED HEAT-TREATED STEEL GEARS IN HEADSTOCK, ASSURING LONGER LIFE

•

ACCURACY .0005 AT EVERY POINT OF ALIGNMENT

GENERAL PURPOSE LATHES
Made in 12", 16", and 20" sizes. (16" shown here).

APRON CONTROL FOR START, STOP, AND REVERSE OF SPINDLE

•

REVERSE IN APRON FOR FEEDS

•

57 FEED AND THREAD CHANGES

•

TAPER GIBS THROUGHOUT

# Sebastian GEARED HEAD LATHES

*Now Manufactured By*

KING

**BUILDERS OF WORLD-RENOWNED "KING" BORING & TURNING MACHINES**

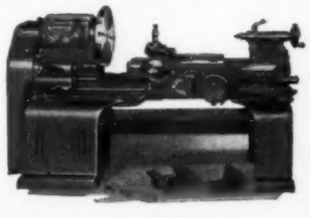
The Sebastian Lathe has long enjoyed a reputation for quality and dependable performance. Today—built in the ultra-modern King plant, with advantages of King engineering skill and production facilities—the Sebastian is an even *finer* lathe than ever before.

Here's definitely *more lathe for your money* . . . more in accuracy, in versatility, in operating ease, in improved construction and longer service life.

The modern Sebastian has all the features of large, high-priced production lathes, making it ideal for general maintenance, repair, and tool room work.

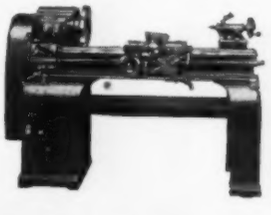
Many items are supplied as standard equipment, included in the basic lathe price. Among these are cabinet leg, tool post, drip pans, threading depth stop, and face plate. Apron control standard on 10′, 12′, and 14′ beds.

See your nearest Sebastian dealer. And send now for new Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes).



**GAP LATHES**
Made in 16" and 20" sizes

**12" GENERAL PURPOSE LATHE**



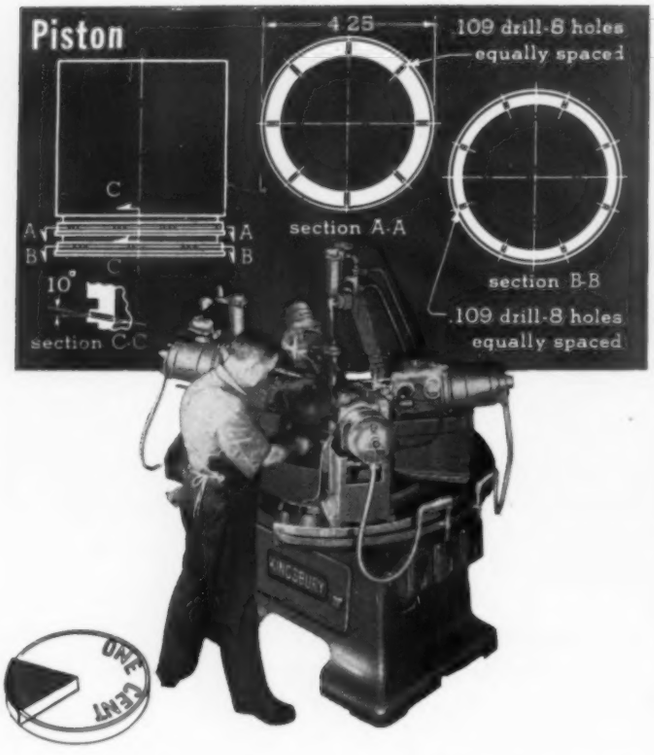
*All Sebastian Lathes are equipped with 8-Speed Geared Heads*

**American Steel Foundries**

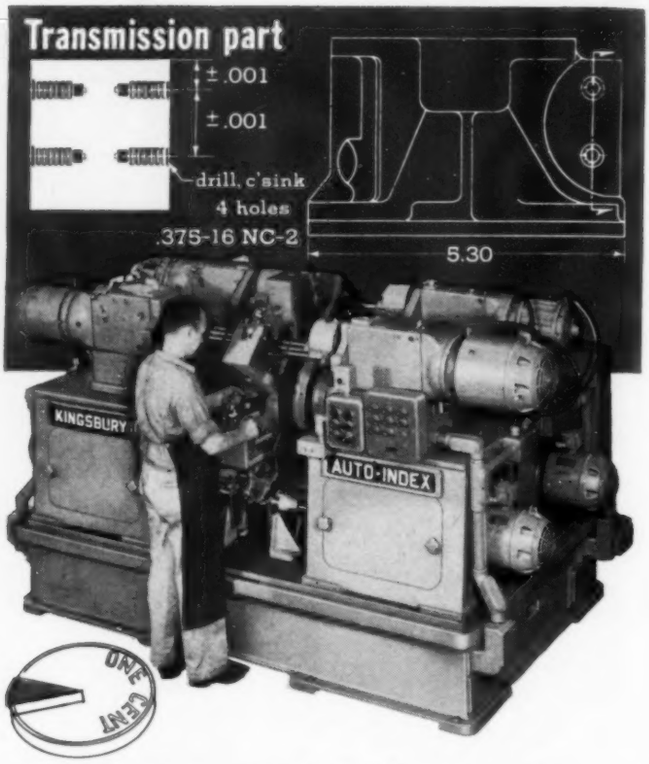
## KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

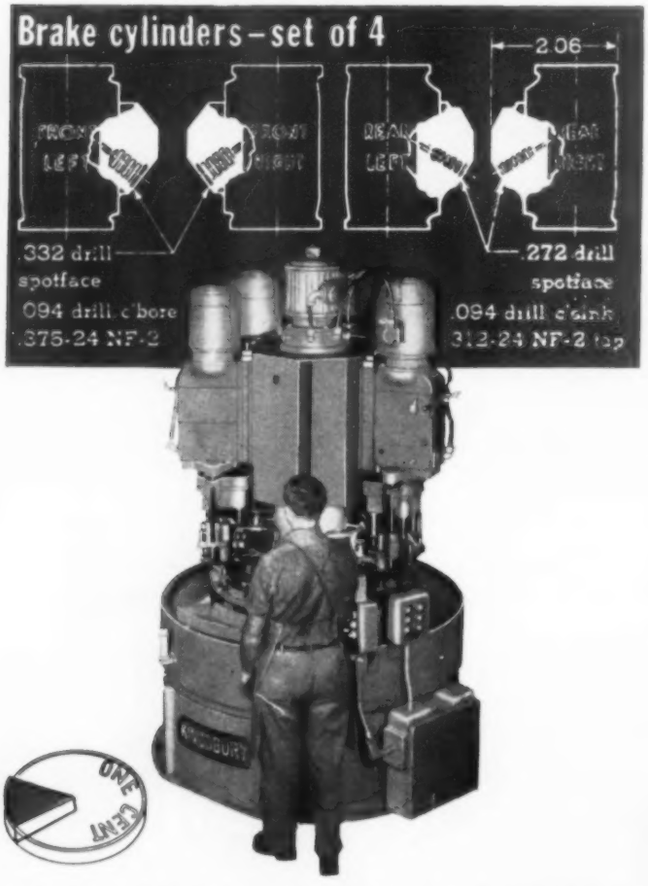
*Builders of Vertical Boring & Turning Machines and Sebastian Lathes*




**An indexing fixture** rotates each part 180° on its axis, 45° at a time. Two opposed units drill holes in section A-A. Two others, each 67½° to the left, drill holes in section B-B. 4 spindles. 100 parts an hour gross. 19/100¢ per operation.




**A vertical indexing machine** enables 4 pairs of opposed units to operate in sequence on each part. Bushings guide the drills and the bushing carriers pilot onto the fixtures. 16 spindles. 537 parts an hour gross. 10/100¢ per operation.




**A horizontal indexing machine with central column** has 7 duplicate fixtures that hold all 4 parts. Vertical units with 4-spindle auxiliary heads do the 5 operations in sequence. 20 spindles. 266 sets an hour gross. 18/100¢ per operation.

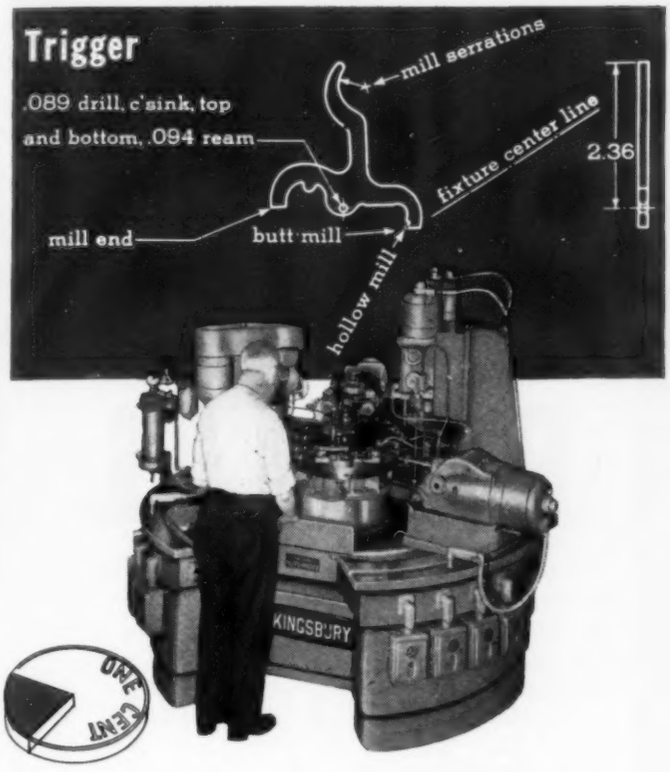
# Precise, uniform cost a small part

All 6 of these machines are basically different. Some do simple jobs, others solve complex problems. Yet all have these features in common:

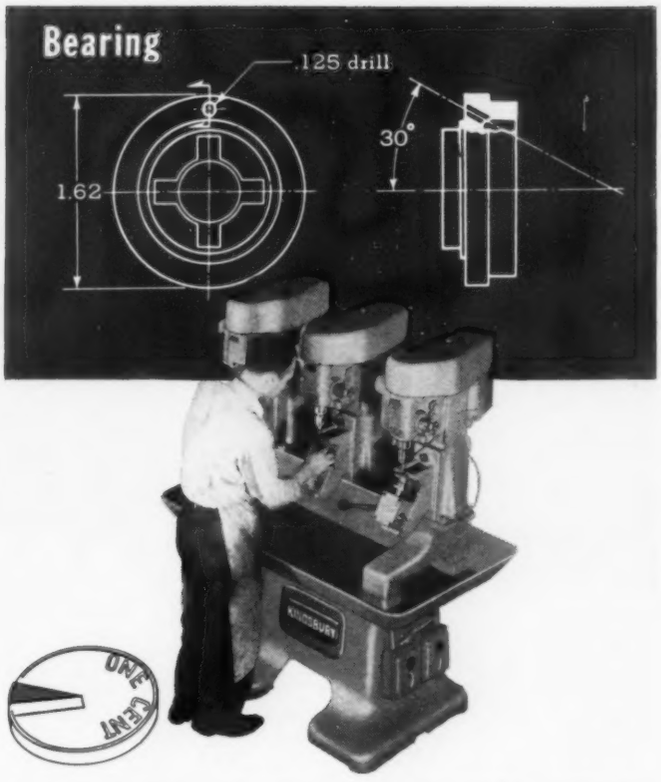
**Low cost.** The blue segment of each penny is the cost per tool per part of the machine *plus* the operator. We assumed the machine would run at 80% efficiency for only 6000 hours (a fraction of its useful life) and we figured on a generous wage rate. No power or overhead. The average for these 6 machines is 16/100 of 1 cent per tool per part.

**Efficient use of standard equipment.** We build 12 standard automatic drilling and tapping units (max. 5 hp), 82 standard attachments, 8 standard index units and 18 standard bases. Our top men study and discuss ways to apply this equipment until they agree on a practical solution.

**KINGSBURY**




**A horizontal indexing machine** has 3 horizontal units that work from 3 directions. All are off the radial lines; one mills on the backstroke. Vertical units complete the part. 6 spindles. 315 parts an hour gross. 22/100¢ per operation.




**A vertical machine** has 3 separate units and 3 fixtures. The operator changes parts in the fixtures and trips the units, one after the other. The work cycle in each unit is automatic. 3 spindles. 1060 parts an hour gross. 8/100¢ per operation.

# operations here of a penny each

**Uniform product.** Automatic work cycles never vary. Fixtures that index are indentical duplicates.

**Accurate location of operations.** Fixtures hold the work rigidly until after the last operation. Bushings guide drills and reamers.

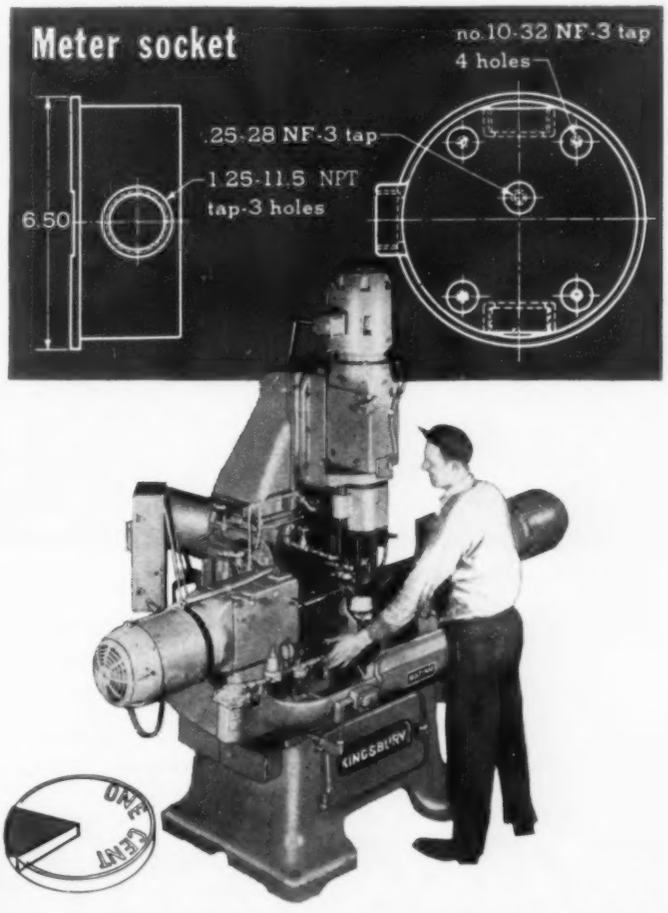
**Operate efficiently for years.** Alloy steel wear parts, hardened and ground. Gears induction-hardened and shaved. Normalized castings and weldments.

**Experience.** We have designed, built and tooled over 3400 machines like these. It is our sole business.

**Proposals.** If you have a high production job with operations like these, ask our Mr. L. A. Carll for a proposal on a tooled machine. Send him a print showing the operations and hourly output you need. Free bulletins show 40 setups. Kingsbury Machine Tool Corp., 30 Laurel St., Keene, N. H. 82

## AUTOMATIC DRILLING AND TAPPING MACHINES

*for Low-Cost High Production*




**A multi-way non-index machine** taps in 4 faces of each part at once. Clamping and unclamping is automatic. Operator merely unloads, loads and presses levers to start the cycle. 8 spindles. 266 parts an hour gross. 17/100¢ per operation.

# FOSDICK

## *Sensitive* RADIAL

*meets the varying needs of*

## TOOL & DIE SHOPS

● Here is a typical illustration of a Fosdick Sensitive Radial in tool and die shop operation.

The flexibility of radial design plus the high speed sensitive operation fills a real need for the tool and die shop.

The adjustable table which assures proper positioning of work for a wide range of small jobs—the full control of feeds and speeds on the head—the fixed position of the arm at convenient height for the operator—all add up to greater production on a wide range of operations.

The machine shown is meeting the diversified needs of the Boston Tool & Die Co. of Boston, Mass.

If your work requires drilling—reaming—tapping or similar operations on holes up to 1½" dia. investigate the Fosdick Sensitive Radial for adaptability—high production—and economy.

Full details available in the Fosdick Sensitive Radial Bulletin S R A. Write for yours.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

# *Quick Write-Off*

## FROM SAVINGS

## ON THE BARBER-COLMAN NO. 14-15 HOBBING MACHINE

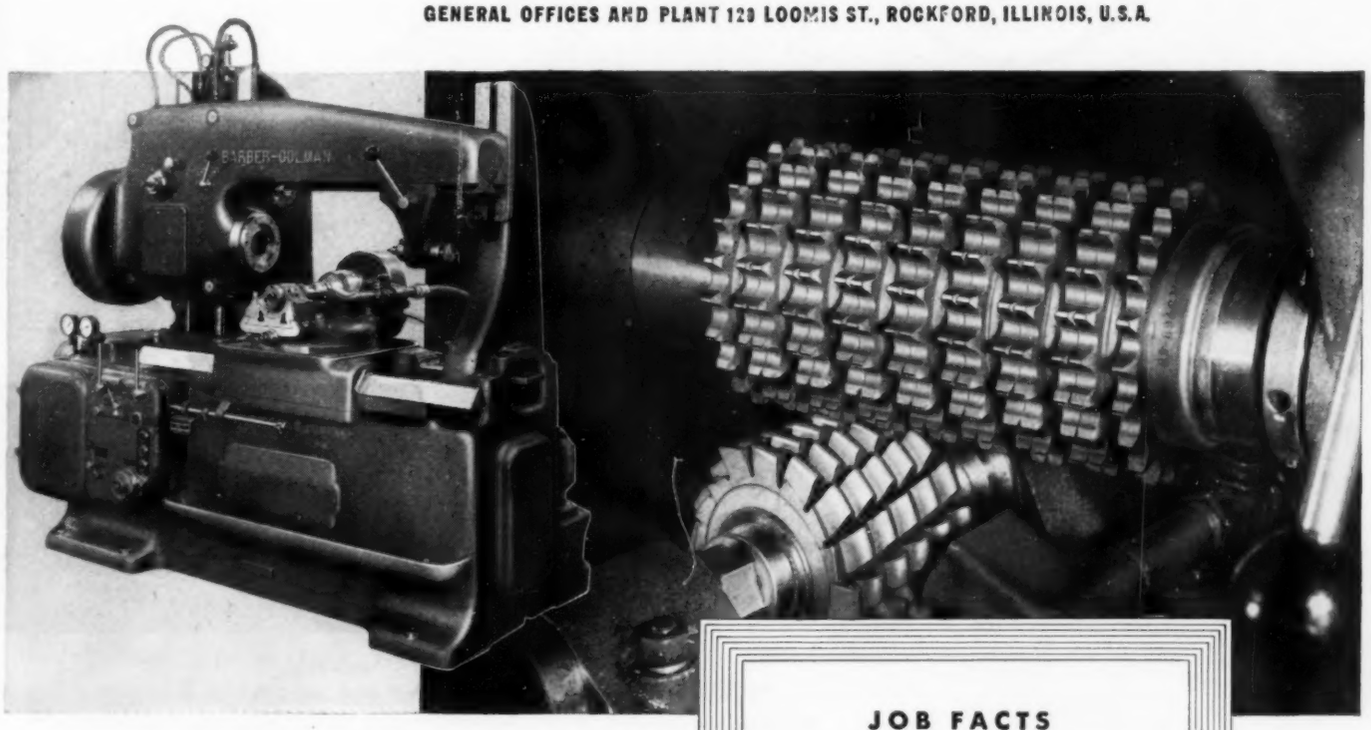
**Replacement of old gear cutting equipment with the Barber-Colman No. 14-15 Hobbing Machine on this sprocket job multiplied production over *four times* . . . from 33 to 144 pieces per eight hour shift on one machine. This increase in production, plus the added savings through reduced scrap, lower labor cost, and fewer machine repairs effectively reduced unit production costs, and permitted *quick recovery* of capital investment.**

**This is one example of how machine tools can outlive economic usefulness, although not yet physically exhausted. The displaced machine in this case did not require scrapping — nor were there any signs that its economic life had expired. Yet, this manufacturer knew, after making a complete cost analysis, that it was uneconomical to continue to use his old machine, regardless of age, physical condition or present book value**

**Write our Sales Engineering Department for a cost estimate proposal on your gear cutting problems. For details on the No. 14-15 Hobbing Machine, send for Bulletin No. 3220.**

# Barber-Colman Company

GENERAL OFFICES AND PLANT 120 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.




BARBER COLMAN

A COMPLETE HOBBING SERVICE

### JOB FACTS

Operation — One-cut finish Hob 3/4" Roller Chain Sprockets, 22 teeth, 5.630" O.D. x .186" face

Pieces per Load — 8

Fl.-to-Fl. Time — 18 pieces per hour

Former Fl.-to-Fl. Time — 4 1/8 pieces per hour

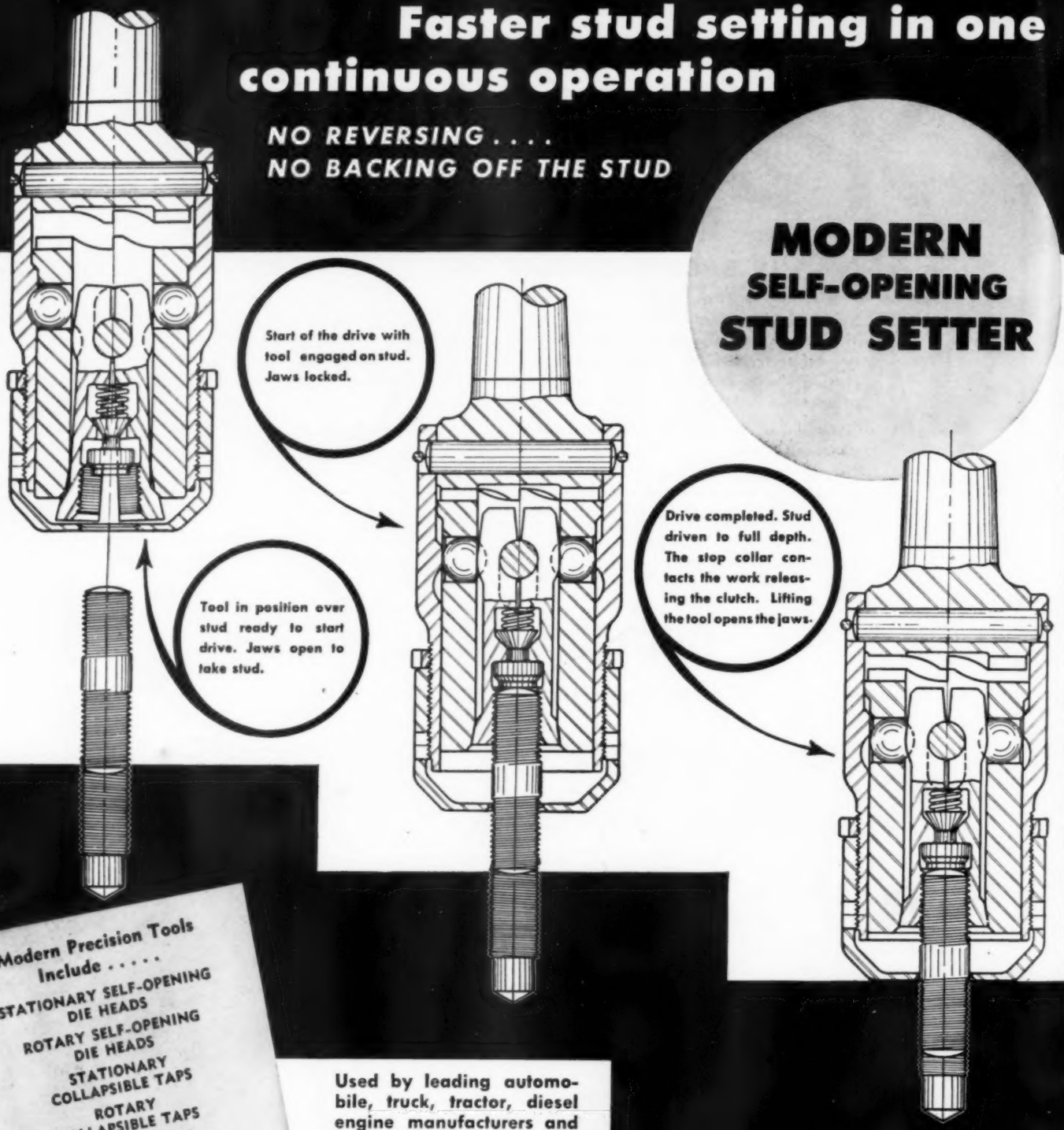
Hob — B-C "Multithread", 5 1/2" x 4", taper bore, ground finish

Feed — .20" per min.

# Faster stud setting in one continuous operation

*NO REVERSING . . . .*
*NO BACKING OFF THE STUD*

## MODERN SELF-OPENING STUD SETTER


Start of the drive with tool engaged on stud. Jaws locked.
Drive completed. Stud driven to full depth. The stop collar contacts the work releasing the clutch. Lifting the tool opens the jaws.
Tool in position over stud ready to start drive. Jaws open to take stud.

**Modern Precision Tools Include . . . . .**

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

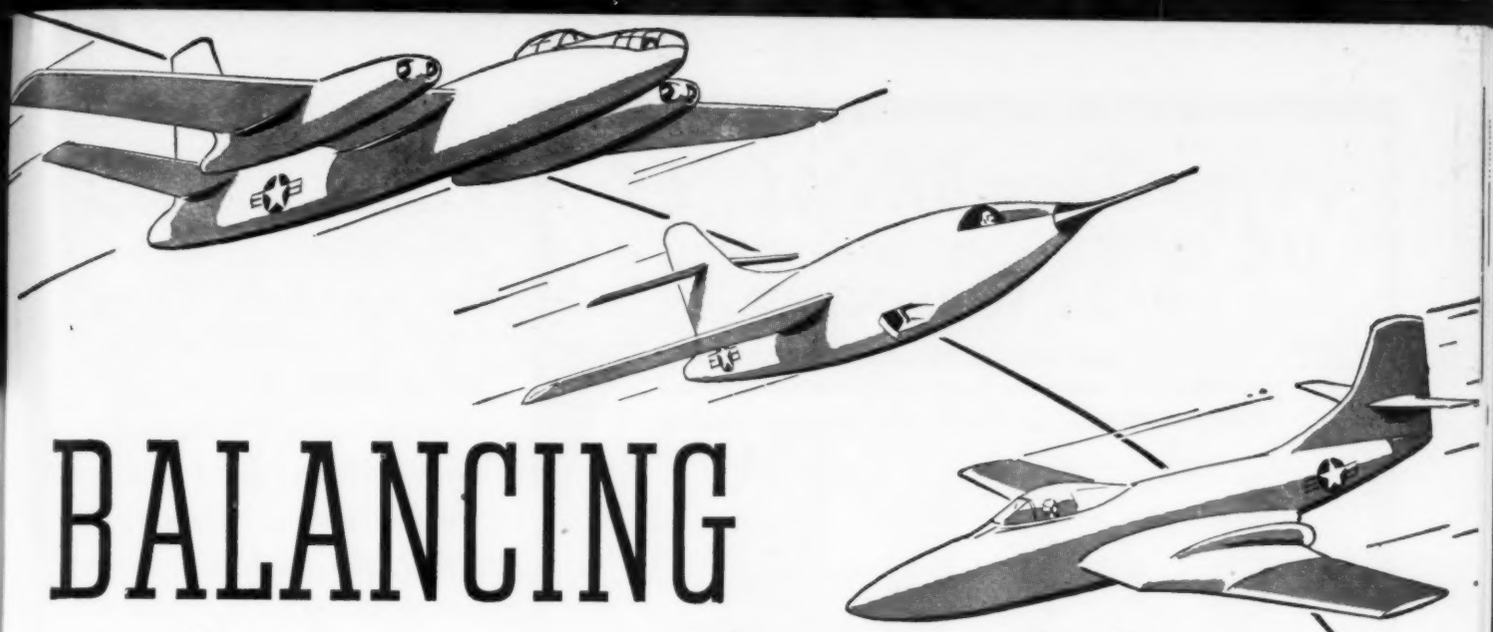
**Used by leading automobile, truck, tractor, diesel engine manufacturers and others with studs to set in quantity.**

**As the action of this tool is positive and automatic, it is conveniently operated in any position with either air or electrically operated portable tools. It is also adapted to use in a drill press where it is possible to drill and tap the holes and set studs in successive operations.**

***For full information, send for Bulletin M-186***

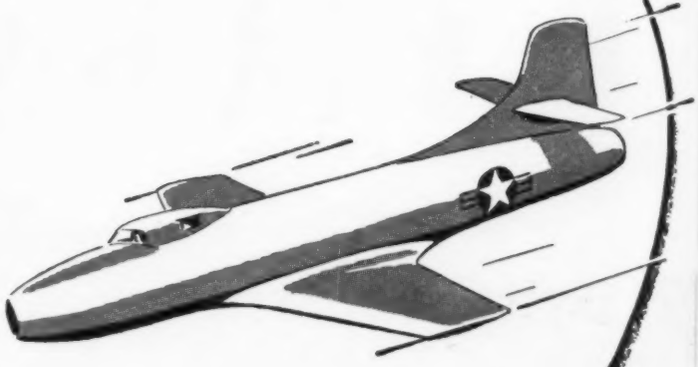
# MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK



# BALANCING

## *keeps pace with the jets!*

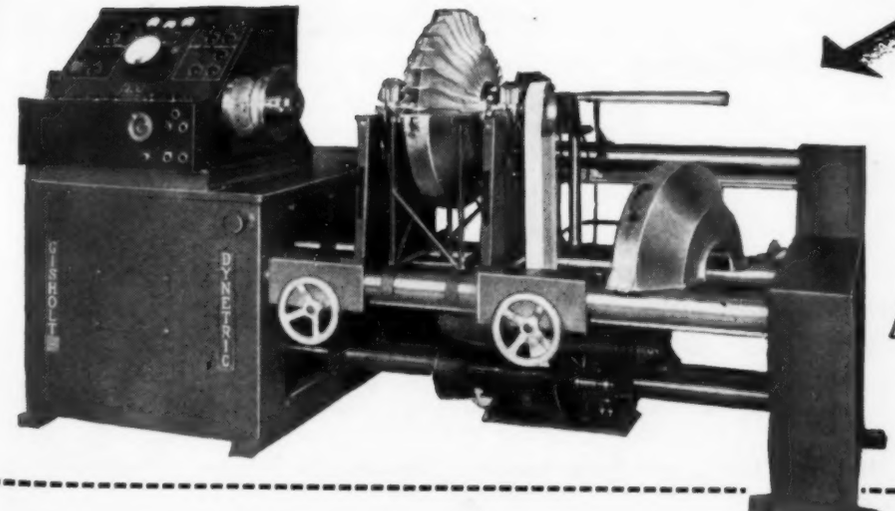


**Racing into the terrifying regions bounded by the speed of sound, the jet planes have also opened new frontiers in engineering. For example, the requirements for accurate balancing exceed all previous commercial standards. At the fabulous operating speeds of the turbo-jet impellers, the slightest vibration caused by unbalance can spell disaster.**

**It is significant that builders of American jet engines have turned to Gisholt Balancers for the unfailing accuracy required in this important work.**

**GISHOLT MACHINE COMPANY**

*Madison 10, Wisconsin*




**Gisholt DYNETRIC Type U Balancer, shown at left, can measure unbalance vibrations as small as 20 millionths of an inch on these turbo-jet compressor impellers.**

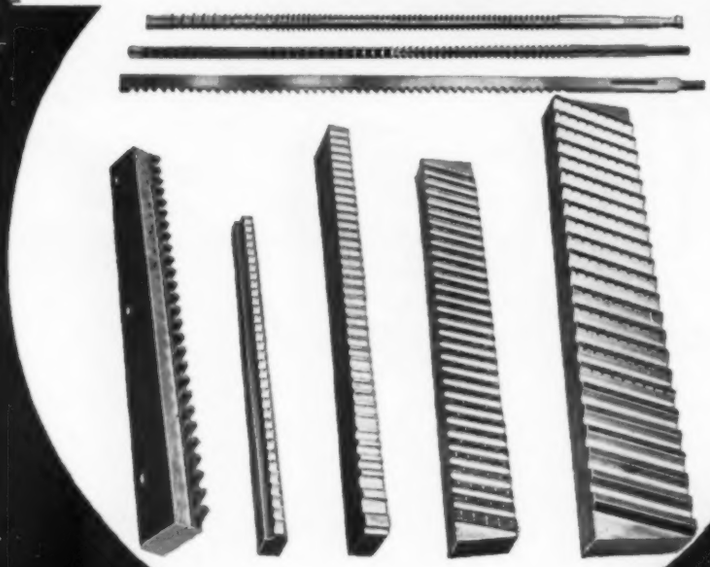
**DYNETRIC BALANCERS** GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION
"DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

**TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES**

# *American* BROACHES

## LAST LONGER ★ IMPROVE FINISH ★ REDUCE RESHARPENING



Shown above are a variety of *American* broaches. Included in the group are a round spline broach, a combination internal and inverted keyway broach, and a keyway broach. Also five sections of different surface broaches. In use, these sections are mounted in a broach holder in progressive stages to form a complete unit.

For every broaching operation, you are sure of better performance and longer life when you specify *American* broaches. *American* broaches give you efficient, dependable production on every type of broaching operation—on keyways, on internal operations such as splines and finishing holes, and surface operations on flats, cams, or irregularly shaped parts.

For the greatest broach economy, efficiency and dependability, insist on *American* broaches, made by a company with more than a quarter of a century's experience in the design and manufacture of broaches, broaching machines, and fixtures.

*American* offers a complete line of push and pull heads to help you get maximum value from your broaches. All types are available, correctly designed for round, flat, keyway, spline, and odd-shaped broaches. A free catalog gives complete data on *American* push and pull heads. Write for your copy today. Ask for Circular 700M.

More than 35,000 gears have been broached to date on this *American* broach, and the broach still has a life expectancy of 35,000 more. The secret of obtaining high production from a well-made broach is proper sharpening at regular intervals. For best results, follow the manufacturer's instructions implicitly: improper sharpening can ruin a good broach. Send for *American's* free catalog on broaches. Just ask for Circular

AMERICAN

## *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND MACHINE TOOL CO. S ROCKFORD ILLINOIS U.S.A.

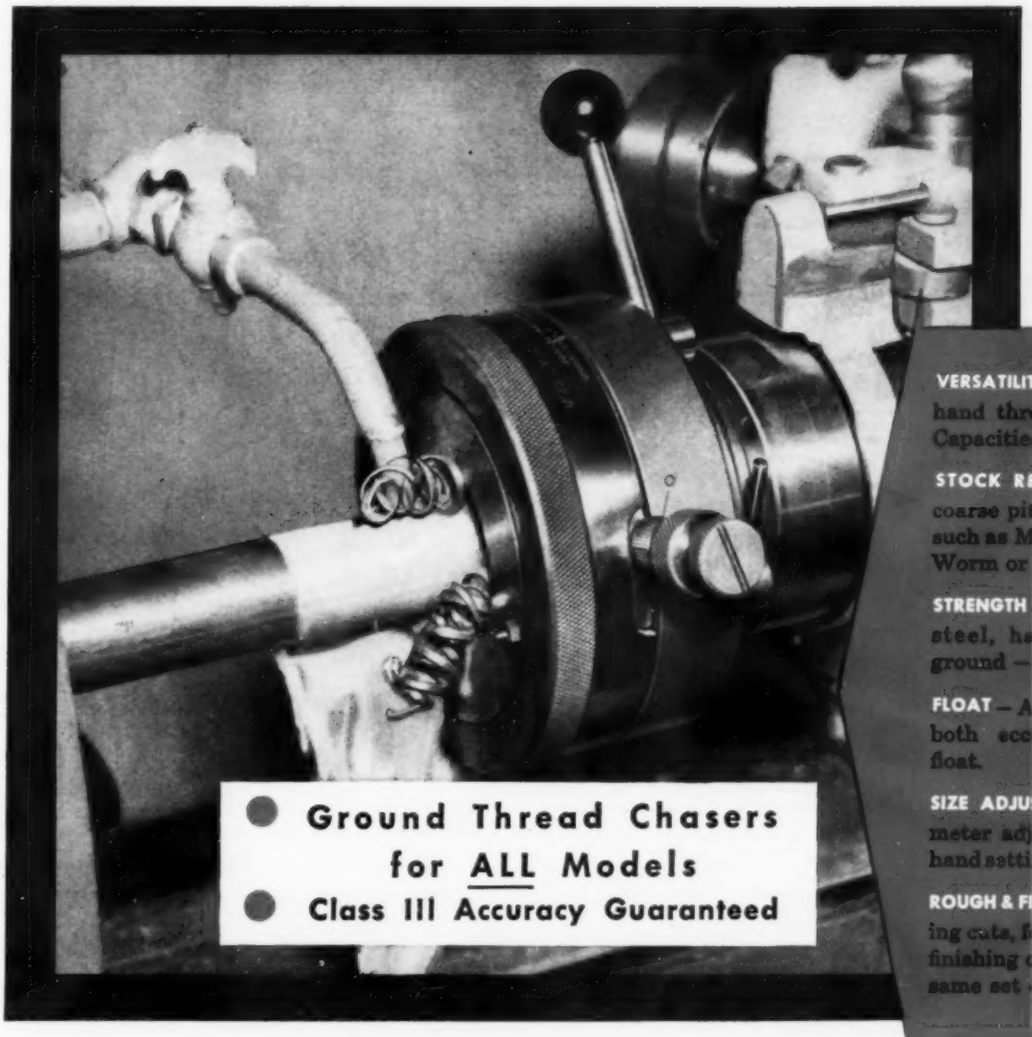
**See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery**

Jones & Lamson

# Ground Thread Chasers for 25 years!

## FIRST and FINEST...

All models of Jones & Lamson RADIAL TYPE Automatic Opening Threading Dies are equipped with GROUND THREAD CHASERS. They are the ideal investment for general threading work involving relatively small lots and diversified pitches. They will lower your tooling inventory too, because standard chaser sets are immediately available from factory stock.




## RADIAL DIE HEADS

**VERSATILITY** – Will cut right or left hand threads, coarse or fine pitch. Capacities from No. 8 to 4¼".

**STOCK REMOVAL** – Unbeatable for coarse pitch, heavy duty threading such as Modified Square, 29° Acme, Worm or other threads.

**STRENGTH** – Every part is of solid steel, hardened and precision ground – no built-up sections.

**FLOAT** – All models are built with both eccentric and longitudinal float.

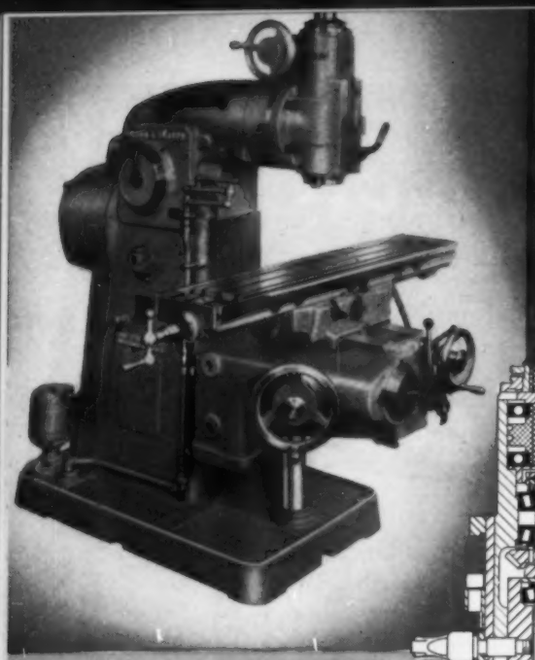
**SIZE ADJUSTMENT** – External micrometer adjusting screw for precise hand setting to exact pitch diameter.

**ROUGH & FINISH LEVER** – Heavy roughing cuts, followed by light, accurate finishing cuts can be taken with the same set of chasers.

**Jones & Lamson**

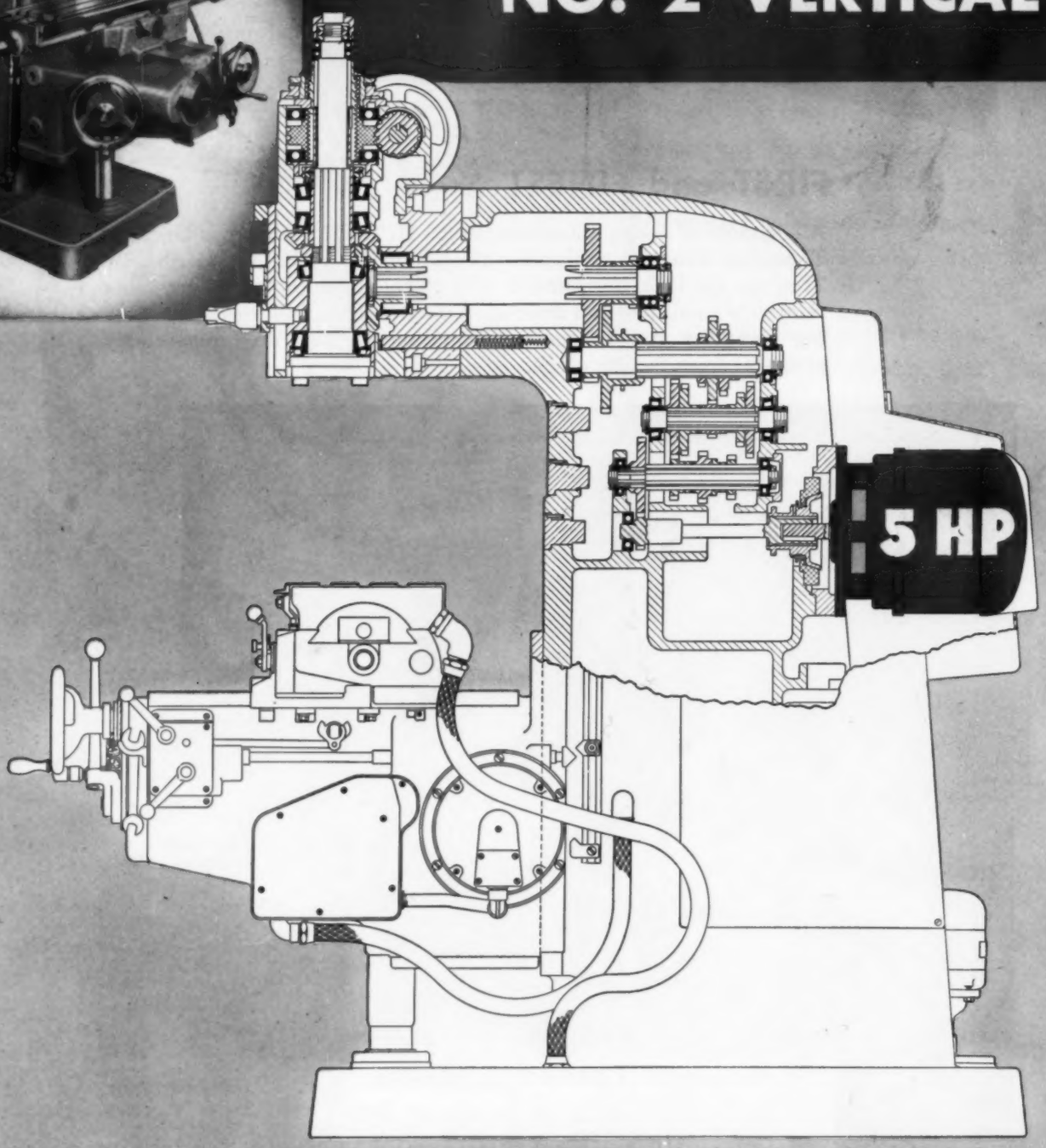
**JONES & LAMSON MACHINE COMPANY**
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies



# NOW A 5

# NO. 2 VERTICAL




**CAPACITY** — Longitudinal feed 28" — transverse feed, 12" — vertical feed of knee 14¾" — all power. Axial feed of spindle 3", hand. Distance, center of spindle to face of column, 14". 18 spindle speeds, 40 to 1530 r.p.m. 18 feed rates, ½" to 20¼" per minute. 75" per minute power fast travel.

BROWN &

# HORSEPOWER MILLING MACHINE FOR HEAVIER CUTS

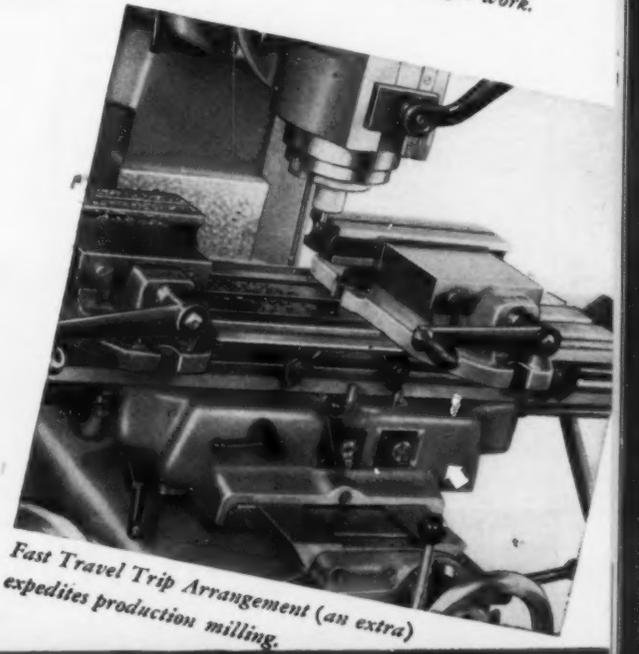
*Swiveling spindle head of exclusive design offers quick angular settings.*

**BROAD UTILITY.** This new addition to the Brown & Sharpe line embodies all the production-boosting features of the popular No. 2 Vertical Light Type Machine. In addition, it has greater throat distance, a No. 50 Milling Machine Standard taper hole in spindle, suitable spindle speeds for larger cutters and ample power plus rigidity for work requiring heavier cuts. Full 5 horsepower is available for spindle drive — with individual motors for table drive and coolant pump.

Engineered for smooth, efficient, powerful cutter driving . . . rigid column casting with integral cross bracing; short, large-diameter shafts supported directly in column; anti-friction bearings supporting all shafts in speed train; independent all-gear drives. Features like these assure highly-accurate production and long, trouble-free performance. Write for details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

*Greater throat distance permits milling of larger work.*

**USEFUL ATTACHMENTS.** As with other Brown & Sharpe Machines, additional equipment is available for the new 5 H.P. No. 2 Machine — saving time and money on many operations. This consists of Rotary Attachments — Turret Type Spindle Stop — Index Centers — Fast Travel Trip Arrangement — Micrometer Table Setting Attachment — Scales and Verniers — Short Lead and Feed Reducing Attachment.



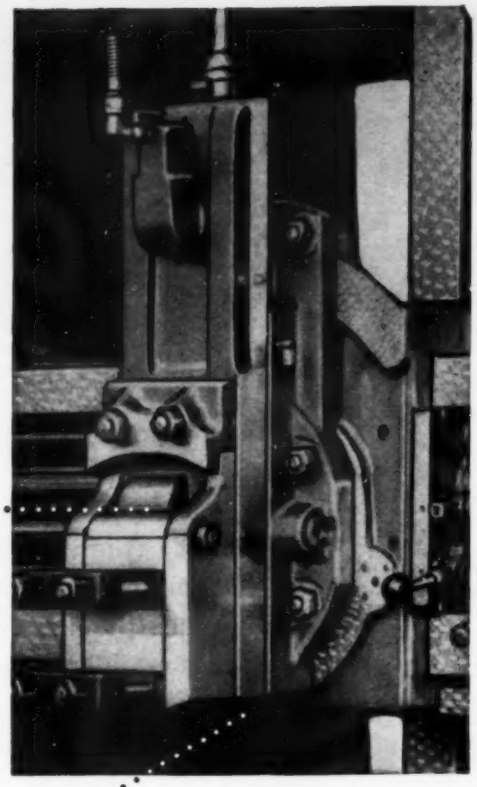
*Fast Travel Trip Arrangement (an extra) expedites production milling.*

# SHARPE

B·S

# ***Both*** *in the Hypro rail head*

## . . . these exclusive Hypro dependable features

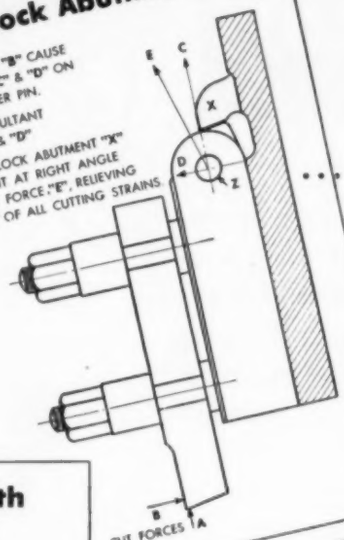


### Exclusive Cincinnati Hypro Tool Block Abutment

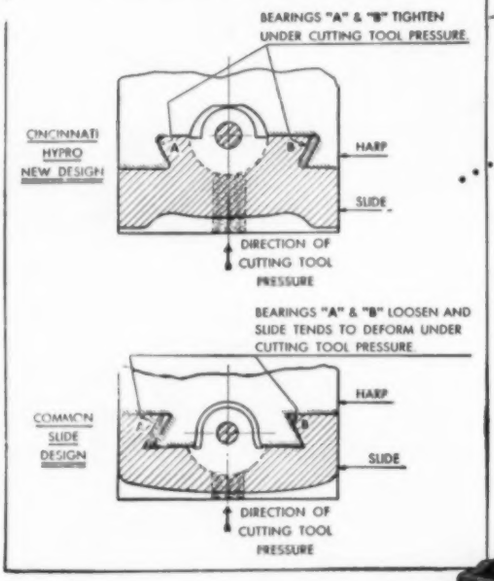
(1.) CUT FORCES "A" & "B" CAUSE ACTING FORCES "C" & "D" ON CLAPPER BOX TAPER PIN.

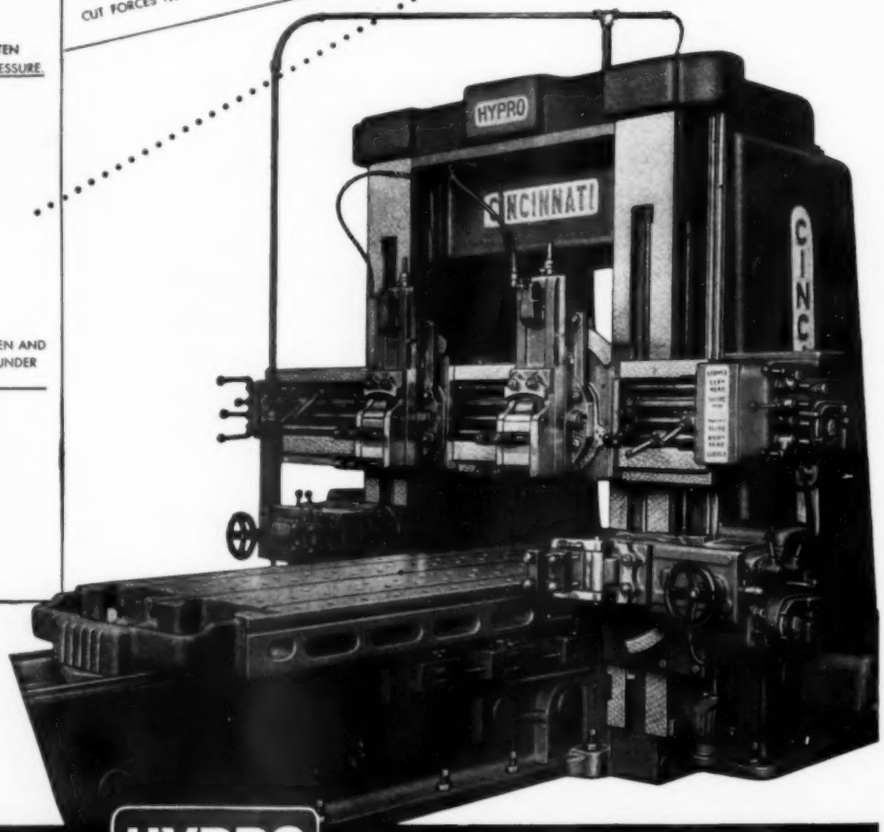
(2.) FORCE "E" IS RESULTANT OF FORCES "C" & "D"

(3.) HYPRO TOOL BLOCK ABUTMENT "X" IS PRECISION FIT AT RIGHT ANGLE TO RESULTANT FORCE "E", RELIEVING TAPER PIN "Z" OF ALL CUTTING STRAINS.




### Full Bearing Slides with Inverted Dove-tail


BEARINGS "A" & "B" TIGHTEN UNDER CUTTING TOOL PRESSURE.
CINCINNATI HYPRO NEW DESIGN
HARP
SLIDE
DIRECTION OF CUTTING TOOL PRESSURE
BEARINGS "A" & "B" LOOSEN AND SLIDE TENDS TO DEFORM UNDER CUTTING TOOL PRESSURE
COMMON SLIDE DESIGN
HARP
SLIDE
DIRECTION OF CUTTING TOOL PRESSURE

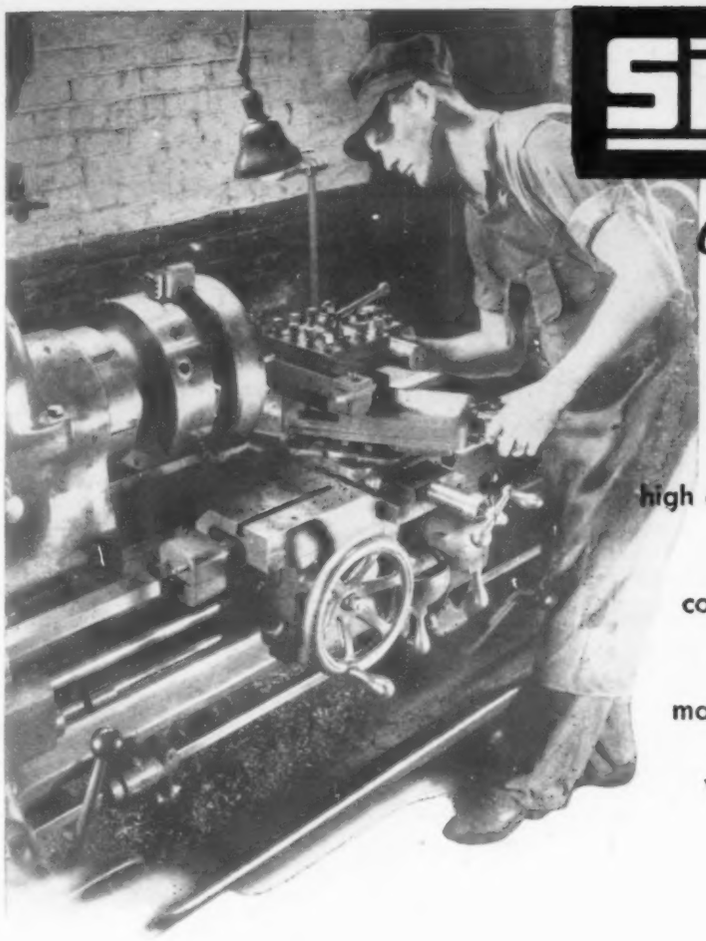



# THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Subsidiary of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

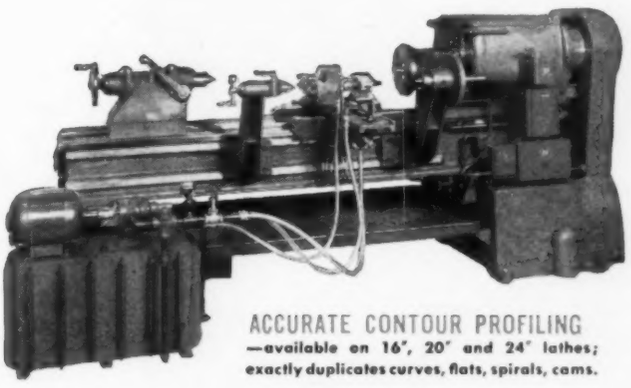


# SPRINGFIELD

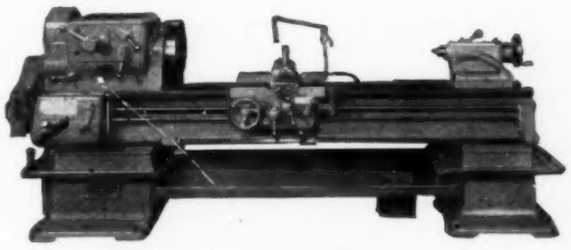
## *Geared Head*
# LATHES

Springfield builds a complete line of precision, high quality, geared head lathes. Every type of lathe built by Springfield is especially designed and constructed to meet all the requirements of modern tooling, and to retain extreme accuracy through many years of full capacity production.

Write for catalogs and detailed specifications.

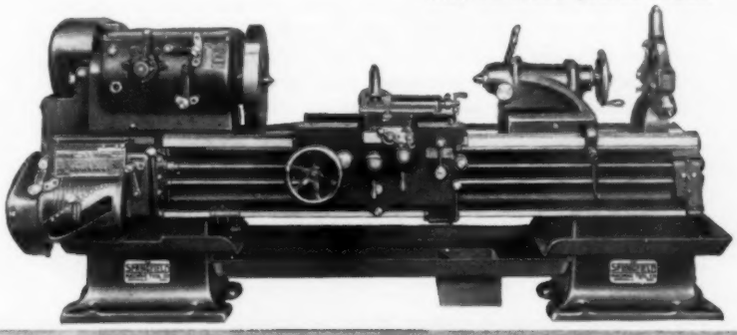


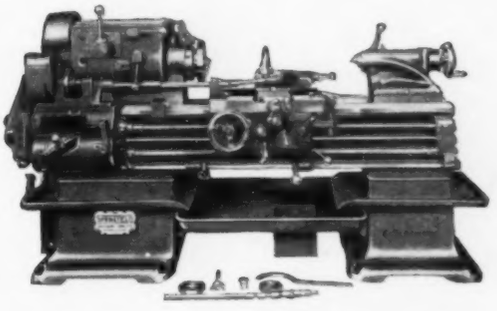
ACCURATE CONTOUR PROFILING
—available on 16", 20" and 24" lathes; exactly duplicates curves, flats, spirals, cams.



MANUFACTURING LATHE
—with unusually wide applications; capable of accurately turning, boring and facing.

SUPER DUTY LATHES
—made in 20" and 22" sizes; equipped with 16-speed geared heads.





TOOL ROOM LATHES
—made in all sizes including 24"; equipped with lead screw reversing mechanisms.

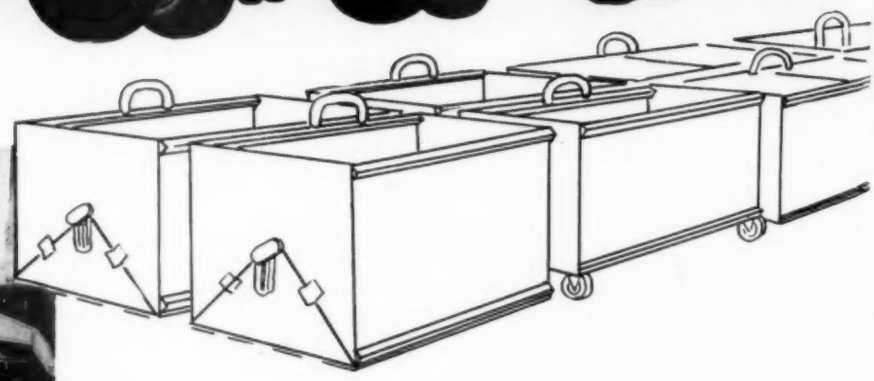
**THE SPRINGFIELD MACHINE TOOL COMPANY**

SPRINGFIELD, OHIO, U. S. A.

**GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6**

*Exclusive Representatives in All Principal Cities*

# THESE FOUR TRUCKS HANDLE 88 CONTAINERS OF 15 DIFFERENT TYPES



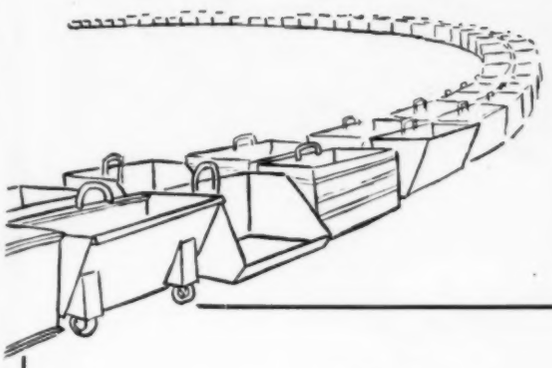
Like many industrial operations, this refinery extends over many acres and handles great quantities of materials, in addition to hundreds of cubic yards of scrap and rubbish daily. Choosing strategic points for receiving material, the 88 containers were placed throughout the refinery, the requirements at each point determining the size and number of containers to be used. At some points for liquid, water-tight containers with lids were required. At others, light, bulky waste called for a big capacity, light-weight enclosed container. Some accumulation points were inside buildings. Containers on casters that could easily be rolled indoors were provided. Each container is assigned to one of the four truck hoisting units and, on a synchronized schedule, is picked up as soon as it is filled. Photos at left show: top-truck hoisting unit backing up to a 6 cu. yd. Universal container. The driver attaches two chains, and then, from controls in the cab, the container is hydraulically lifted into carrying position (see photo at left center). Arriving at the disposal area, the container is automatically dumped (see photo left below). The container is then returned to its original point for reloading and the truck hoisting unit moves on to the next container on its route. Pick-up and dumping operations require only a matter of seconds, thus it is possible for one man and one truck to handle any number of containers, keeping a steady flow of material moving without waiting or wasting time.

On opposite page are illustrated the types of containers in the original installation and the materials they handle. Note how easily the basic Dempster-Dumpster containers are converted for special purposes by the simple addition of lids, casters or some other special change.

The Dempster-Dumpster system is saving money in large and small plants alike. Its great flexibility makes it adaptable to any plant, regardless of size, and assures tremendous savings along with amazing improvements in efficiency. A survey of your plant, without charge or obligation, could reveal the amazing effectiveness of the Dempster-Dumpster System.

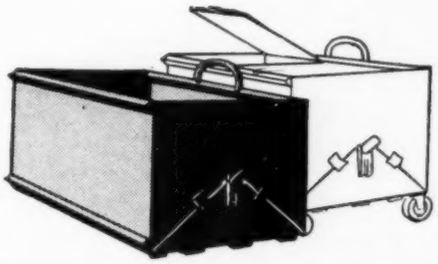
**DEMPSTER BROTHERS, Inc.**

# . . . THIS IS THE DEMPSTER-DUMPSTER SYSTEM
# . . . SAVES THIS REFINERY $58,000 ANNUALLY

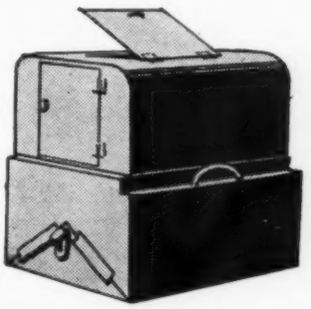


The Dempster-Dumpster System of Materials Handling, simply stated, permits the use of any required number of detachable containers, of various designs and capacities, to be serviced by a single truck. Its ability to effect tremendous savings in handling numerous types of materials has been definitely established in hundreds of leading industrial plants.

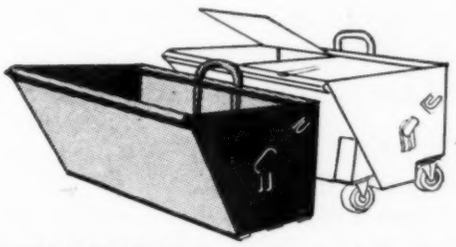
In this particular case, in a large refinery, four of the twelve trucks formerly detailed for materials handling, including scrap and rubbish collection, were equipped with Dempster-Dumpster Hoisting units to handle 88 detachable containers of 15 different types. The Dempster-Dumpster System of quick pick-up and dumping of pre-loaded containers has worked wonders in efficiency, plant appearance, and savings. In one year savings of over $58,000 was shown by our engineers survey. Time has proved the correctness of this survey. Since the original order of 88 containers, so many more uses for the equipment and greater savings were discovered that 55 additional containers have been placed in service with a grand total of 143 containers now being handled by the four trucks.



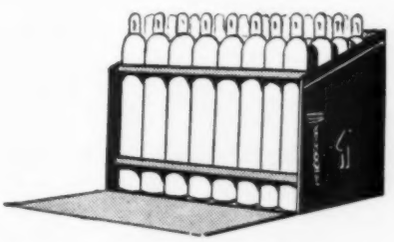
DROP BOTTOM CONTAINERS. 48 drop-bottom containers were furnished for handling trash and rubbish, steel turnings, scrap metal, tube ends and clay:—Twenty 6 cu. yd. open top type, one 6 cu. yd. with lids, nine 2½ cu. yd. open top type, two 2½ cu. yd. open top with casters, six 3 cu. yd. open top, nine 4 cu. yd. with lids, one 4 cu. yd. enclosed with hinged door in top.



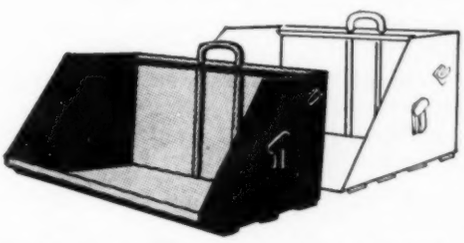
UNIVERSAL CONTAINERS. 13 universal containers were furnished for handling trash and rubbish. Universal containers feature completely enclosed construction, drop-bottom dumping, a door in either end for ground-level loading and a lid in the top for loading from a platform.



TILT TYPE CONTAINERS. 16 tilt type containers were furnished for handling general refuse, sludge and settlings:—Four 3 cu. yd. open top type, nine 3 cu. yd. with lids, three 3 cu. yd. with lids and casters.



SPECIAL CONTAINERS. 3 special containers were furnished for handling and transporting oxygen cylinders from one point to another in the refinery. This container is typical of the many highly specialized uses for which Dempster-Dumpster containers are constructed. Many other containers are available for handling almost any type of material known, be they liquid, dust, light or bulky or very heavy materials.

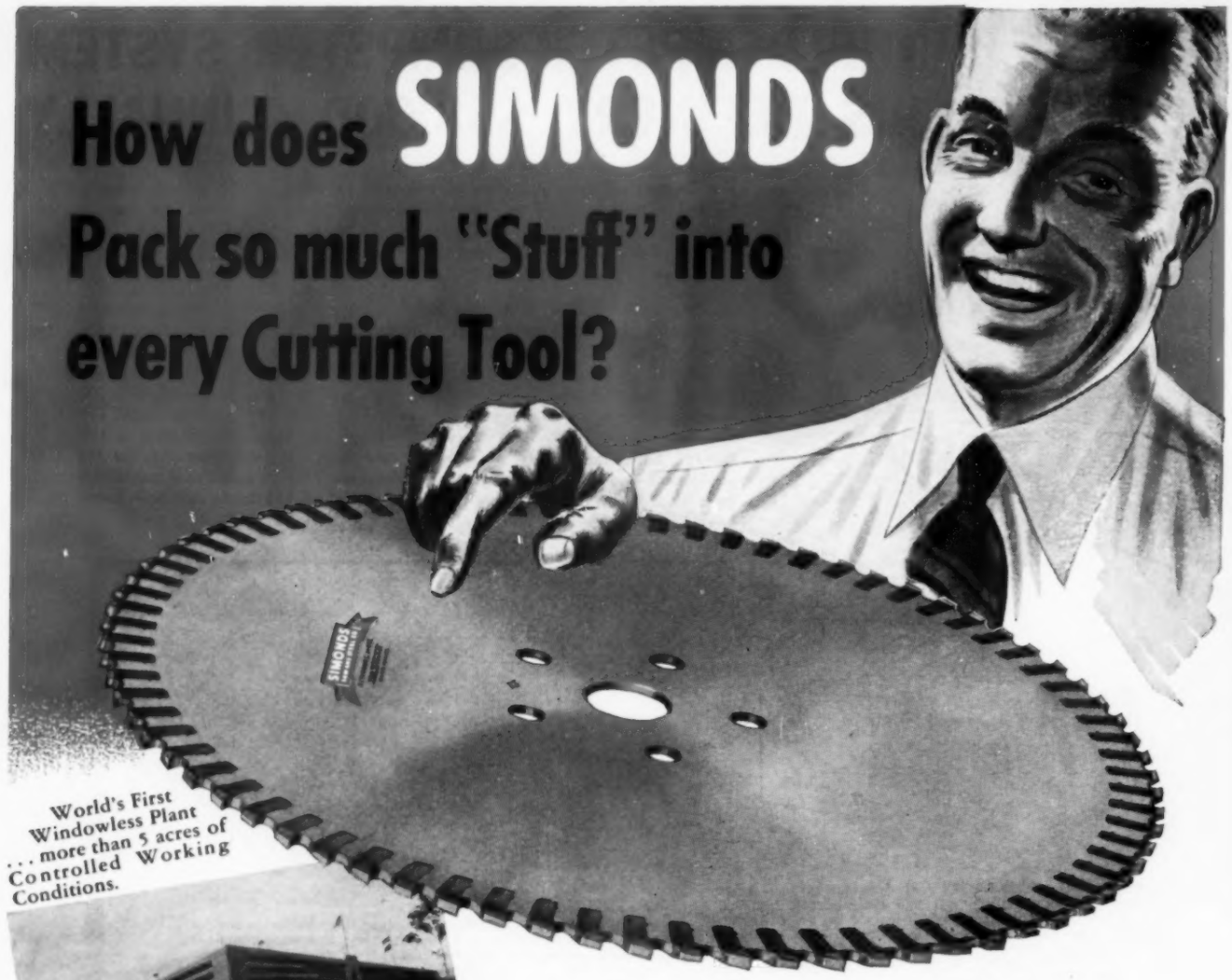


SKIP TYPE CONTAINERS. 7 skip type containers were furnished for handling refuse wax, oil, lube and coal:—Three 3 cu. yd. skip type with lid, three 3 cu. yd. skip type without lid, one 3 cu. yd. skip type with teeth.

DEMPSTER DUMPSTER
TRADE MARK REG.
SYSTEM

**4118 DEMPSTER BUILDING, KNOXVILLE 17, TENNESSEE**

# How does SIMONDS Pack so much "Stuff" into every Cutting Tool?



World's First Windowless Plant . . . more than 5 acres of Controlled Working Conditions.

Simonds' Own Steel Mill guarantees the unmatched quality and uniformity of Simonds cutting edges.

Co-operative Resources of 4 Simonds Companies assure service unequalled in the field of cutting-tool manufacture.

## Here are 6 Quick Answers

### to this Often-Asked Question about SIMONDS SAWS, KNIVES and FILES

1. **Longest experience . . .** 115 years. Long experience per man . . . Simonds craftsmen *stay* with Simonds.
2. **World's First Windowless Plant . . .** air, light, sound completely controlled for better work, higher product-quality, faster delivery.
3. **Simonds Steel Mill . . .** Modern electric furnaces, under close laboratory control, pour all Simonds special cutting-tool steels.
4. **Simonds Own "Sharpeners" . . .** Simonds organization includes a top producer of grinding wheels . . . part of the secret of Simonds famous "Mirror Finish."
5. **Simonds Research:** New metals, methods, and cutting tools . . . these come *first* from Simonds.
6. **Simonds 4-Company Organization:** All quality controlled from raw material to *you.*

That's why Simonds Tools cut *your* cutting costs. Order from your Distributor.

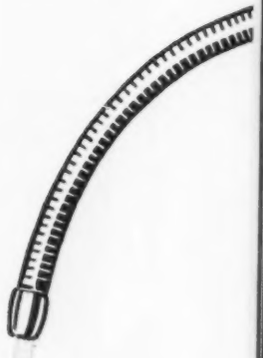
**BRANCH OFFICES:** 1350 Columbia Road, Boston 27, Mass.; 127 S. Green Street, Chicago 7, Ill.; 416 W. Eighth Street, Los Angeles 14, Calif.; 228 First Street, San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

**When you use SIMONDS You stay in the Highlands OF CONSISTENT CUTTING EFFICIENCY**

# Operators see PINK... and love it

THE PINK they see is Cimcool, the revolutionary cutting fluid that makes the working picture a lot rosier. For Cimcool isn't subject to rancidity and objectionable odors. It's a *chemical emulsion*. Can't burn. Can't smoke. Has no unpleasant odor of its own.

And there are more reasons why operators prefer the job with Cimcool in the machines. Cimcool is clean to work with, doesn't soil hands or clothes. Leaves no hazardous slippery film on hands, machine, work or floor. Contains no skin irritants. And Cimcool cools so fast that tools and chips actually stay cool to the touch. You'll get better production when operators see pink—see CIMCOOL on the job.



CIMCOOL DIVISION OF THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

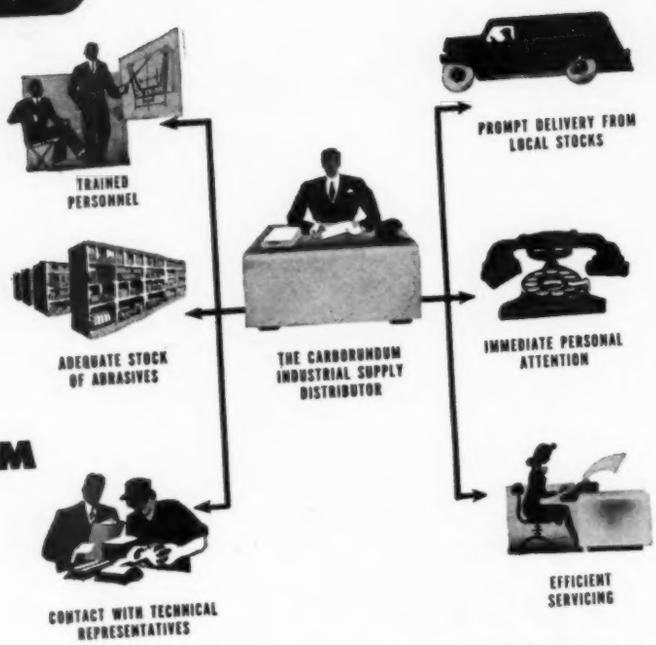
# CIMCOOL for 85%

Trade Mark Reg. U. S. Pat. Off.

OF ALL METAL CUTTING JOBS

# A BUYING GUIDE FOR ABRASIVES

**ABRASIVE PROBLEM:**
**Where is there a convenient Source of Supply?**




**ANSWER BY**
**CARBORUNDUM**
TRADE MARK

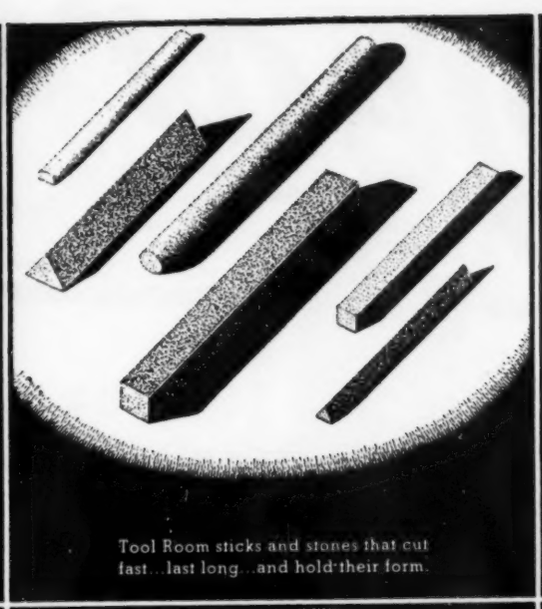
As an efficient and dependable source of supply, the services and facilities of your CARBORUNDUM distributor offer time and money saving advantages.

From large and varied stocks of abrasives located conveniently nearby, the products you need are available without delay. Plant inventories can be safely and economically reduced. Frequent personal service by a trained and experienced local staff provides reliable facts and figures on abrasive applications and operations. On difficult or unusual jobs, direct assistance from CARBORUNDUM representatives is available.

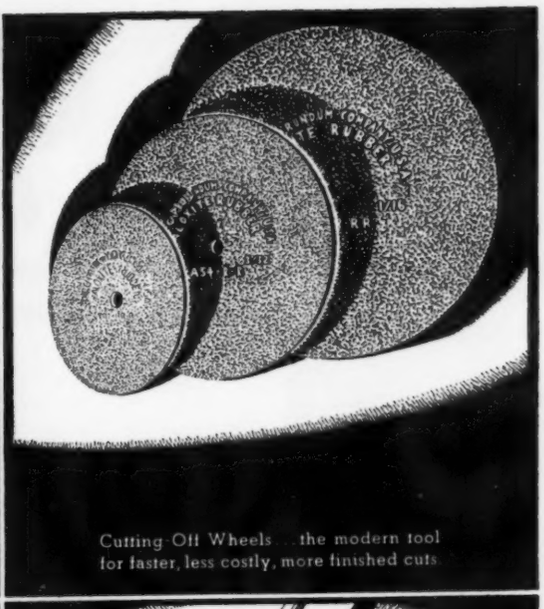
Simplified buying and other important savings realized from intelligent and efficient handling are creating an increasing preference for abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

"CARBORUNDUM" IS A REGISTERED TRADEMARK WHICH INDICATES MANUFACTURE BY THE CARBORUNDUM COMPANY

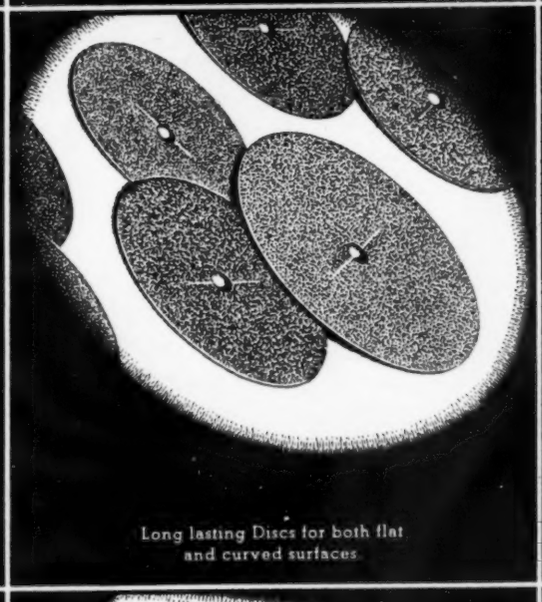
**A Good Rule for Good Grinding**



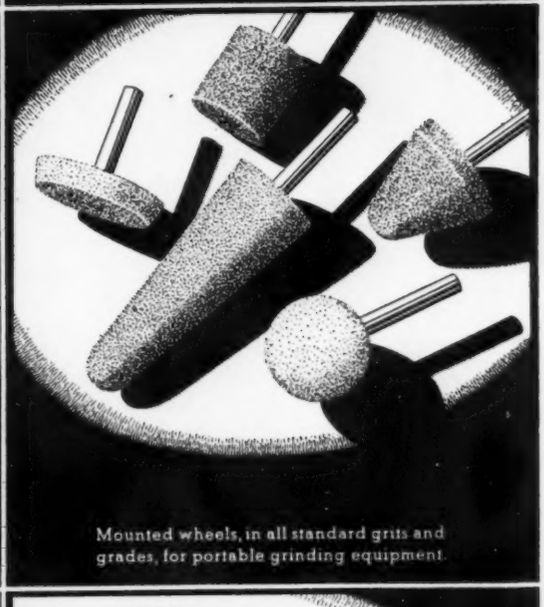
Tool Room sticks and stones that cut fast...last long...and hold their form.



Cutting-Off Wheels...the modern tool for faster, less costly, more finished cuts.

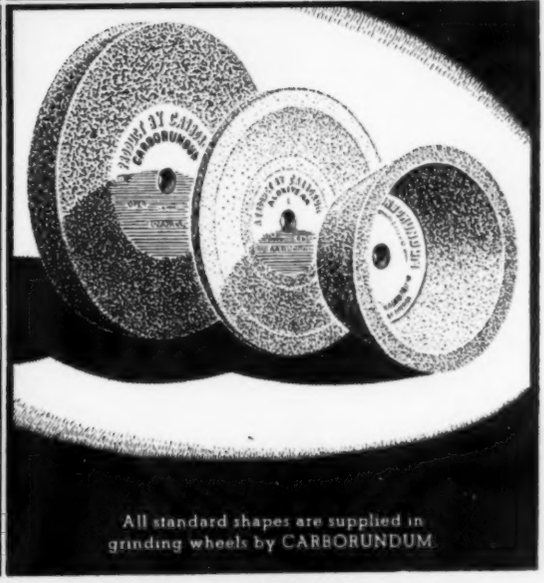


Long lasting Discs for both flat and curved surfaces.



Mounted wheels, in all standard grits and grades, for portable grinding equipment.

A Coated Abrasive for every sanding and finishing condition.



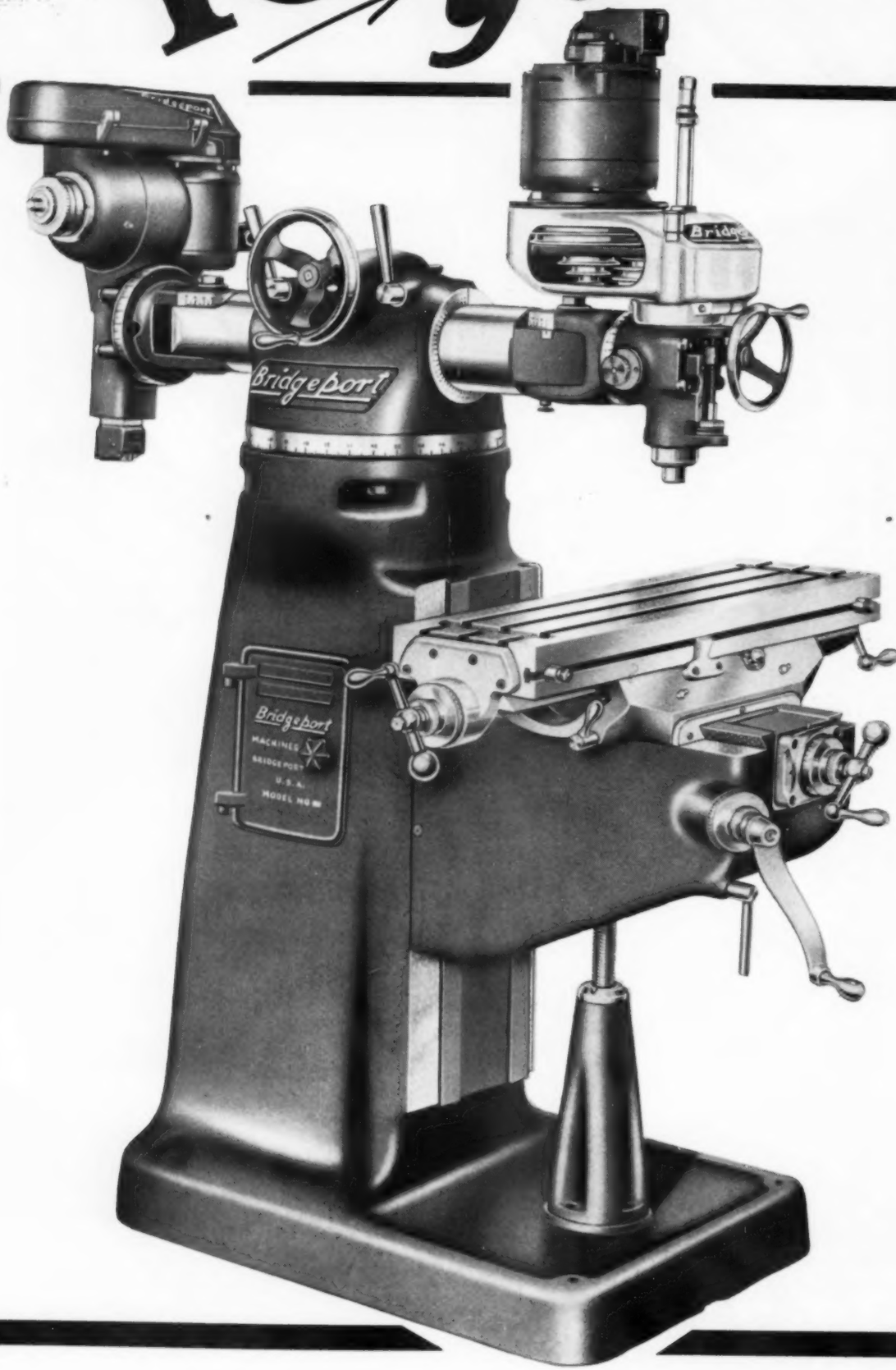
All standard shapes are supplied in grinding wheels by CARBORUNDUM.

**... CALL IN CARBORUNDUM**

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

# 10 years!



# 10,000 machines!

## A MESSAGE from the BUILDERS of...

# Bridgeport TURRET MILLING MACHINES

While the manufacture of Bridgeport High Speed Milling Attachments goes back to 1931, we are now in the tenth year of production of the Bridgeport Turret Milling Machine. Possibly 10,000 milling machines is a record for one size and one type produced by any manufacturer. However, we believe it is undoubtedly a ten-year record in the manufacture of vertical milling machines of one size.

The following achievement on holding the price line is worth noting:

First Turret Milling Machine with master attachment was shipped in 1938 ..... price $995.00
in 1939 ..... " "
in 1940 ..... " "
in 1941 ..... " "
in 1942 ..... " "
in 1943 ..... " "
in 1944 ..... " "
in 1945 ..... " "
in 1946 ..... " "
in 1947 ..... " "

**The 10,000th Milling Machine shipped in 1948 was priced at $995.00.**

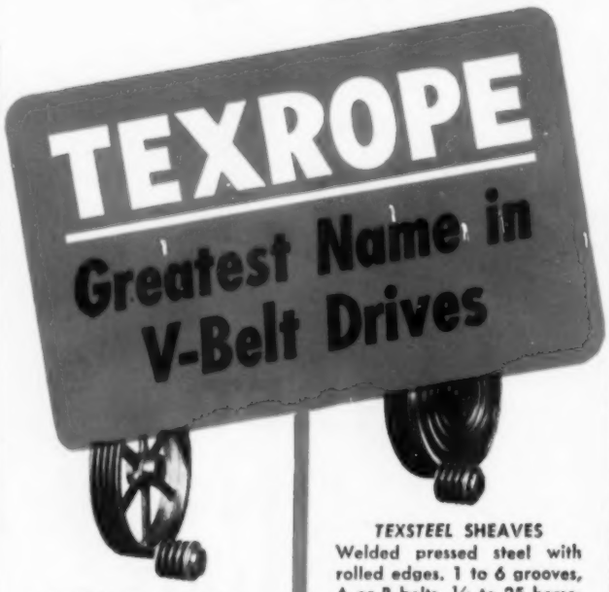
Modern tooling, special machines of our own design and the late type machines of our fellow Machine Tool Builders have made this achievement possible for a ten-year period. The most important contribution, however, has been made by a labor force which has understood that wage and material increases can only be paid out of better and more efficient production. Their cooperation is as important as anything we have achieved in mechanical improvements.

We look back on the past ten years with a great deal of satisfaction and assure our users and friends that our aim for the future will be as useful and constructive as our record during the past ten years.

BRIDGEPORT MACHINES, INC.
R. F. BANNOW, President
M. WAHLSTROM, *Treasurer*

**Bridgeport MACHINES, INC.**
*Bridgeport, Connecticut*

# Fills Every Need for V-Belt Drives!

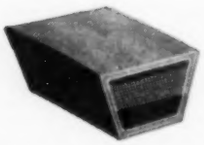



***TEXDRIVE* SHEAVES**
Cast Iron with 1 to 6 grooves for A and B belts. 1 to 25 h. p. *All sizes from stock.*

***VARI-PITCH* WIDE RANGE SHEAVES**
Speed range up to 100%. 1 to 4 grooves, Q and R belts, fractional to 30 horsepower. Delivery good. *Call your nearest District Office or Texrope dealer.*

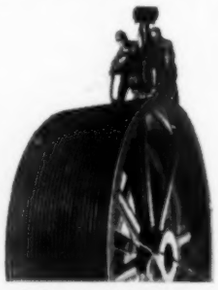
***TEXSTEEL* SHEAVES**
Welded pressed steel with rolled edges. 1 to 6 grooves, A or B belts, ¼ to 25 horsepower. *All sizes from stock.*

**STANDARD CAST IRON SHEAVES**
Made to order from stock patterns. 1 to 14 grooves, A, B, C, D, or E belts, 1 to 1000 horsepower. Delivery good. *Call your nearest District Office or Texrope dealer.*



***TEXROPE* SUPER-7 V-BELTS**
Wide range of types, sizes and sections to suit all operating conditions. *All standard sizes from stock.*

***MAGIC-GRIP* SHEAVES**
Semi-steel with patented taper bushing. On and off in a jiffy. 2 to 12 grooves, B, C, or D belts, 2 to 250 horsepower. *All sizes from stock.*



**SPECIAL CAST IRON AND STEEL SHEAVES**
Any number of grooves for A, B, C, D, or E belts. Up to 6000 horsepower. Delivery good. *Call your nearest District Office or Texrope dealer.*

***TEX-IRON*, SHEAVES**
Light weight single groove sheave for fractional horsepower applications. *All sizes from stock.*

***VARI-PITCH* STANDARD SHEAVES**
Speed range 9% to 28%. 2 to 10 grooves, A, B, C, D, or E belts, 1 to 300 horsepower. Stationary or Motion Control. Delivery good. *Call your nearest District Office or Texrope dealer.*

***VARI-PITCH* SPEED CHANGERS**
Speed range to 375%. 1½ to 75 horsepower. Single handwheel controls speed. Delivery good. *Call your nearest District Office or Texrope dealer.*

## Best Delivery in the Industry!

NOW *YOU CAN GET* nearly every standard V-belt drive component from Texrope stocks. Even on non-stock items, Texrope delivery is the best in the industry. And Texrope is the *only* brand that meets every V-belt need.

Selecting a drive is as easy as looking up a telephone number in the 144 page Texrope Pre-Engineered Drive book. Covers 90% of all V-belt drives. Write today for Bulletin 20 B 6956 or see your nearest Allis-Chalmers Authorized Dealer or District Office. Also listed in Sweet's.

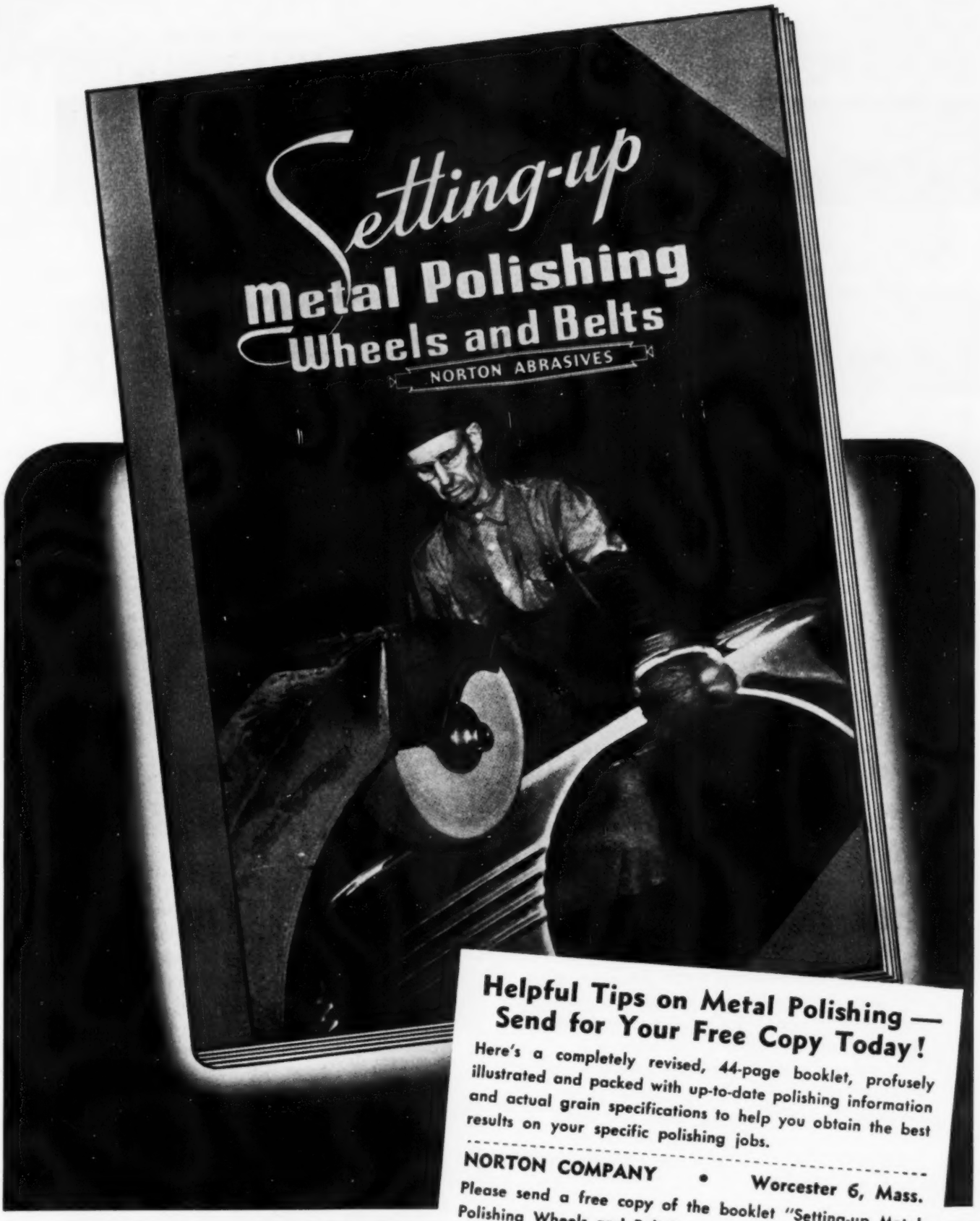
ALLIS-CHALMERS, 999A SO. 70 ST. A 2546
MILWAUKEE, WIS.

*Texrope, Super-7, Vari-Pitch, Magic-Grip, Tex-Iron, Texsteel and Texdrive* are Allis-Chalmers Trademarks.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

# ALLIS-CHALMERS

***Originators of the Multiple V-belt Drive for Industry***




**Helpful Tips on Metal Polishing — Send for Your Free Copy Today!**

Here's a completely revised, 44-page booklet, profusely illustrated and packed with up-to-date polishing information and actual grain specifications to help you obtain the best results on your specific polishing jobs.

**NORTON COMPANY** • **Worcester 6, Mass.**

Please send a free copy of the booklet "Setting-up Metal Polishing Wheels and Belts".

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Firm_____

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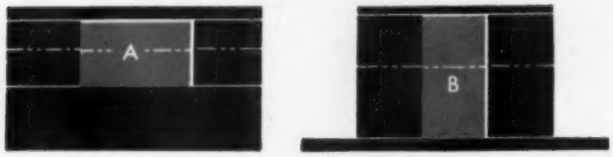
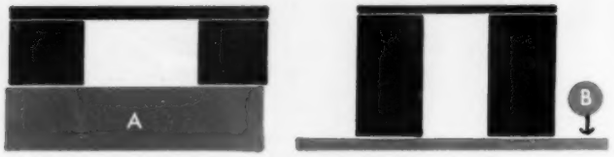
G-195

NORTON ABRASIVES

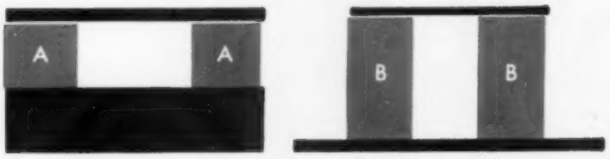
Choose "A" or "B"
**TOOLING AREA**
(Work and Tool Axis)



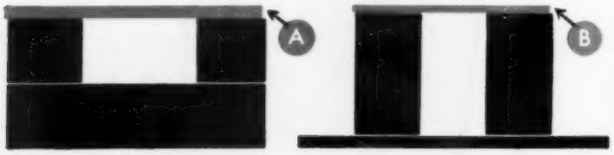

Choose "A" or "B"
**BASE SUPPORT**




Choose "A" or "B"
**UPRIGHT SUPPORTS**




Choose "A" or "B"
**TOP SUPPORT**




# HOW GOOD ARE YOU ON MACHINE DESIGN?

**The all-round efficient service given by any machine tool, and the opportunity for its improvement and development, usually depend on advantages afforded by its basic design. Before purchasing a machine it will pay to look for the advantages or disadvantages of its basic design.**

**Above are illustrated two types of frame design of Multiple Spindle Automatic Bar Machines. Assuming that the Tooling Area is important — and is as efficient as the frame around it permits —which of the two designs would you choose to meet the following requirements?**

| | MACHINE #1* | MACHINE #2 | MACHINE #3 | MACHINE #4 | MACHINE #5 |
|---|---|---|---|---|---|
| WORK & TOOL CAPACITY | ✓ | | | | |
| WORK & TOOL SUPPORT | ✓ | | | | |
| WORK & TOOL MAINTENANCE | ✓ | | | | |

*CONOMATIC

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make.

Why not use a measuring stick to chart your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask the Cone representative.

### WORK & TOOL CAPACITY

**Long, open, roomy Tooling Area and long main end slide for handling longer work and for clearing die heads in threading, etc., to the full collet capacity of the machine; for heavy cross-slide cuts, deep hole drilling, and general all-round work with HSS or Carbide Tools.**

### WORK & TOOL SUPPORT

**Genuine, horizontal, rectangular box-frame, free of overhang; heavy-set, rigid upright members for supporting head-stock and gear box units between heavy, full-length top and base members, for substantial support of all work and tools close to the work and tool axis, and for the maintenance of accurate alignment of work and tools.**

### WORK & TOOL MAINTENANCE

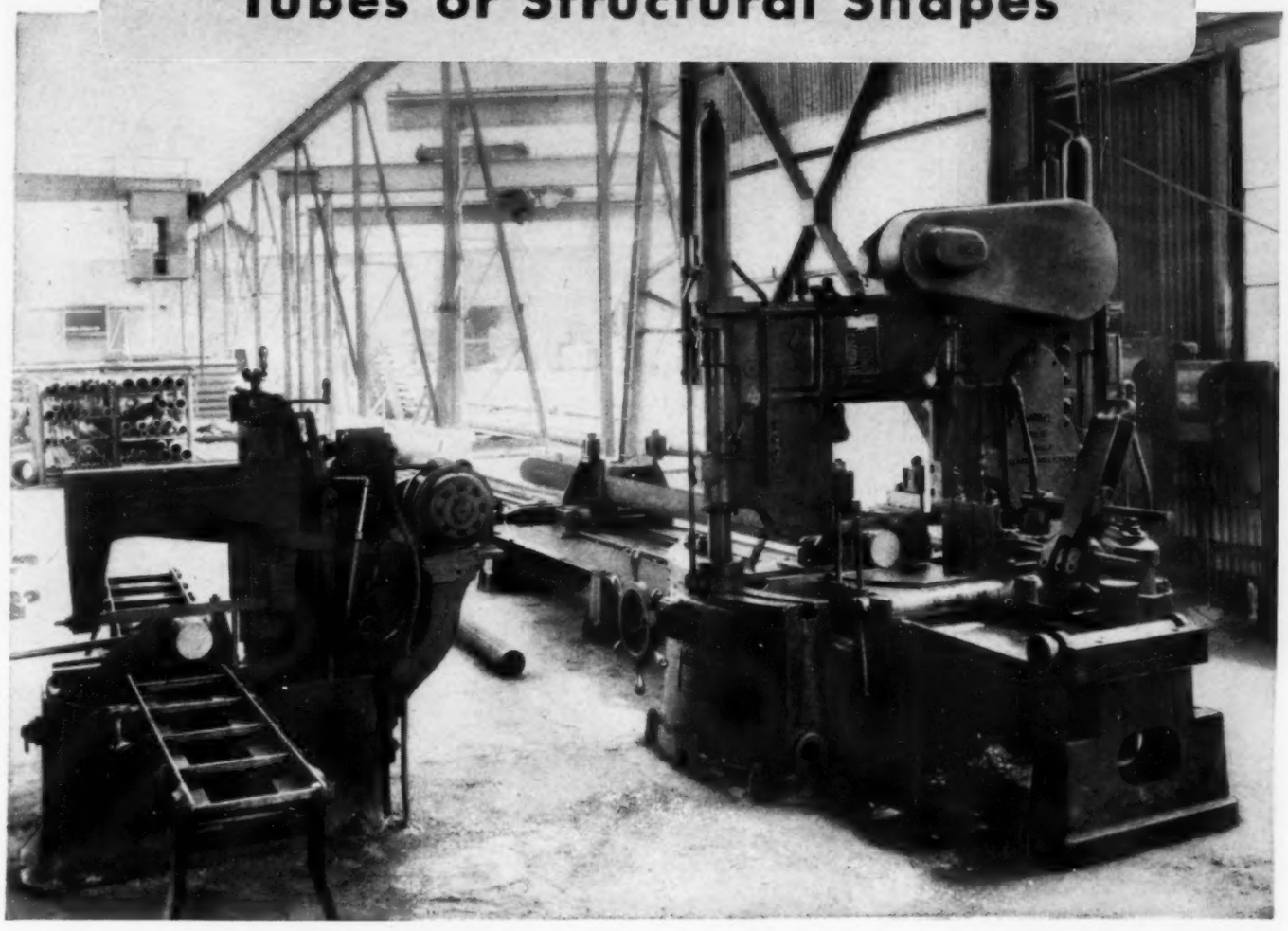
**Heavy, strong, well supported, overhang-free, vibration-free, liberal bearing, convenient, adjustable, work holding units and tool slides, with accessible chip-free cams, with adequate capacity in base member for chip disposal and cutting coolant.**

*A comparison with ALL Automatics will lead you to*

# Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

# Ideal for Oil Tools, Forging Bars, Tubes or Structural Shapes



The cutting-off department of Baash-Ross Company takes all sawing jobs as they come for they are equipped to quickly, easily and economically cut off steel of any size, type or shape. In the "oil tool" business you cut off about everything from drill rod to giant well drilling tools, from copper tubing to great 18-in. dia. heavy walled steel liner casings for wells. All can be quickly and accurately cut off with the saws illustrated—a No. 9A MARVEL High Speed Hack Saw (Capacity 10" x 10") and a No. 18 MARVEL Giant Hydraulic Hack Saw.

*Ask to have the local MARVEL Sawing Engineer analyze your sawing problems, make recommendations and quote prices. Write for Catalog.*

## ARMSTRONG-BLUM MFG. COMPANY

*"The Hack Saw People"*

**5700 BLOOMINGDALE AVENUE** **CHICAGO 39, U. S. A.**

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

## HOW MUCH CAN YOU SAVE?

You, too, can make savings in production time, jig fabrication and worker fatigue with a BULLARD 30″x20″ Man-Au-Trol Spacer. Your savings will run into worthwhile figures. So, why not investigate fully this revolutionary new hole-locating method? Write today for the latest BULLARD Man-Au-Trol Spacer bulletin. THE BULLARD COMPANY, Bridgeport 2, Conn.

BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

2.

BULLARD CREATES

# PRODUCTION-LINE NEWS ABOUT BULLARD MAN-AU-TROL SPACERS

**1.**

**HERE'S HOW ONE LOOKS IN ACTION AND WHAT THE USER SAYS**

This is a BULLARD 30"x 20" Man-Au-Trol Spacer being used by Kearney & Trecker, Milwaukee, Wisconsin with the following reported results: "We find that on parts where we do not have fixtures, the saving is considerable. We find that due to accurate positioning, we get more accurate work. We also find new uses every day; uses which we never thought of when we purchased the equipment".

***HERE'S WHAT TWO OTHERS HAVE DONE***

**AT HEPPENSTALL COMPANY, PITTSBURGH... PRODUCTION TIME CUT BETTER THAN 36%**

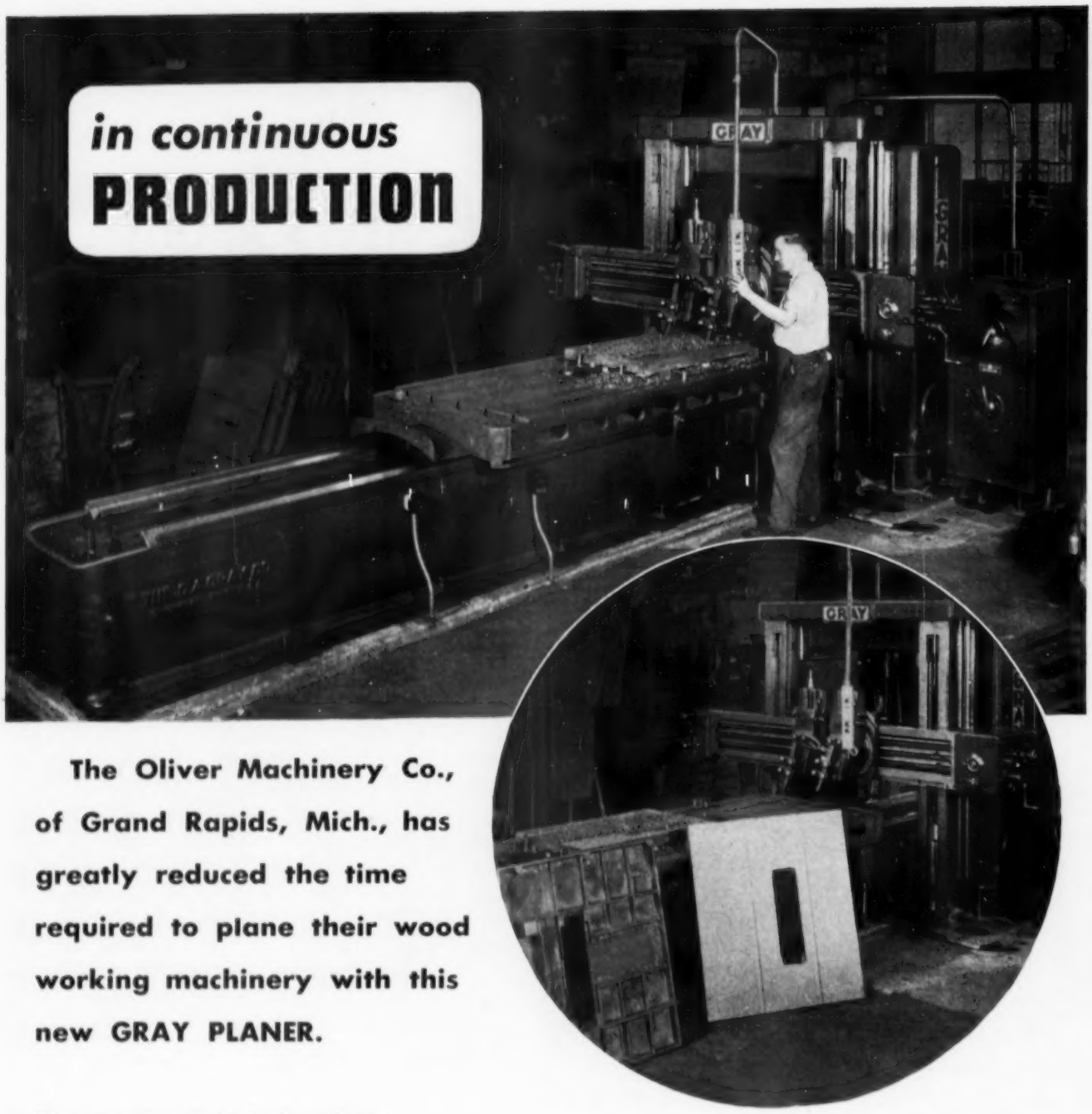
Drilling and countersinking 13/16" diameter holes in this chipper knife used to take 95 minutes per piece for layout and drilling. The same job done with a BULLARD 30"x 20" Man-Au-Trol Spacer, including set-up time, takes only 60 minutes. According to C. W. Heppenstall, Jr., vice-president of this progressive firm, this new hole-locating method is "a real advancement in the science of metal working".

**3.**

**AT R. HOE & CO., INC., NEW YORK CITY . . . OVER $2500 IN JIG FABRICATION SAVED IN 3 MONTHS**

This maker of fine printing presses *not only* saved time on every job handled by a BULLARD Man-Au-Trol Spacer *but also* eliminated 75 hole-locating jigs in three months for a total saving of $2500 to $3000. Officials of R. Hoe & Co., Inc. further report that plans for constructing one of the world's largest presses for the Philadelphia Inquirer will require practically no jigs because of the use of the BULLARD 30"x 20" Man-Au-Trol Spacer.

***NEW METHODS*** TO MAKE MACHINES DO MORE







**The Oliver Machinery Co., of Grand Rapids, Mich., has greatly reduced the time required to plane their wood working machinery with this new GRAY PLANER.**

*Here are some typical savings:*

| | OLD TIME INC. SET UP | NEW TIME INC. SET UP | % INCREASED PRODUCTION |
|---|---|---|---|
| Rough Plane Small Wood Planer Table | 2.9 hrs. | 1.8 hrs. | 61.0% |
| Rough & Finish Plane Large Lathe Bed | 54.0 " | 25.75 " | 110.0% |
| Rough Plane Large Wood Planer Table | 7.4 " | 5.9 " | 25.5% |
| Finish Plane Wood Planer Table | 4.5 " | 1.58 " | 185.0% |
| Rough & Finish Plane Small Lathe Bed | 24.3 " | 13.9 " | 75.0% |

***And in addition, finish accuracy has been greatly improved!***

**FOR FASTER, BETTER PLANING—INVESTIGATE THE NEW GRAY**

*The G.A.* **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

# ALLIS-CHALMERS

# "Certified" Service

A BREAKDOWN on this 39-year-old Allis-Chalmers fan motor crippled operations at the plant of an important midwest electric utility. Immediate repair was vital. The Chief Engineer called the nearest Allis-Chalmers Certified Service shop. They picked up the rotor and returned it ready for service in less than twenty-four hours.

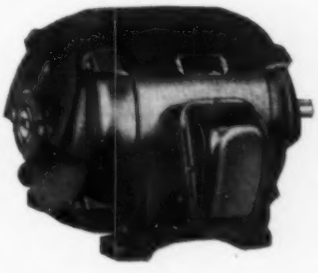
This is the kind of emergency cooperation you can expect from every Allis-Chalmers Certified Service shop. On everyday repairs and maintenance too, your Allis-Chalmers Certified Service shop will give you prompt service on Allis-Chalmers motors, pumps and transformers, using factory approved methods and parts. Every Allis-Chalmers Certified Service shop has been selected for skilled, personal, careful workmanship, adequate equipment and *service mindedness.*

## HOW TO FIND NEAREST SERVICE SHOP

Allis-Chalmers Certified Service shops are located in major industrial centers throughout the country. New shops are being appointed continuously and most smaller centers will soon be covered. To find the shop nearest you, call your closest Allis-Chalmers District Office. A 2543

## MOTOR DELIVERIES GREATLY IMPROVED

**Many types of Allis-Chalmers Motors are now in stock! Many other types are available on short delivery! For motors from 1 to 200 HP, check your nearest Allis-Chalmers Authorized Dealer. For motors larger than 200 HP, check with the nearest District Office. You may be able to get what you need sooner than you think.**



ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

# ALLIS-CHALMERS

**Pioneers in Power and Electrical Equipment from Generation through Utilization**

# no other hob will outperform a UNION

See Catalog R
for various types of hobs

## contact your local distributor

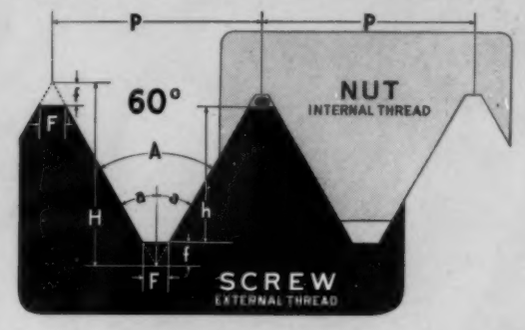
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.
BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.
BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

# The Science of Making MODERN SCREW THREADS

The basically simple idea of a screw thread has developed into a highly exact science in an age of machines that are held together by billions of threaded parts.

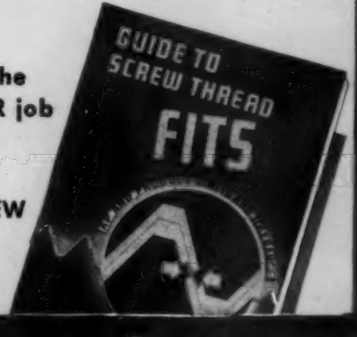



The sketch shows the basic design of the standard American screw thread. It cannot, however, begin to show the intricate problems which are involved in applying this and other thread forms to the varied uses of industry.

To make screw threads suitable for the exacting demands of mass production – modern industry requires three tools – a tap, a die, and a gage. The key word to describe the relationship of these three tools in terms of results is – "FITS". Working to tolerances of ten-thousands of an inch – the screw thread engineer must design and build the tools that will produce the RIGHT "fit" for the job.

Gages are an important member of the GTD "Greenfield" threading team that insures the right "fit" on the modern assembly line. It is only natural that the makers of precision taps and dies should also be qualified to make the gages needed to check them. *Today, when you think of taps and dies – think of gages, too. And when you think of all three – think of GTD "Greenfield", world's headquarters for threading tools.*

**To help you get the right "fit" for YOUR job write for a free copy of "GUIDE TO SCREW THREAD FITS"**




GTD GREENFIELD

*World's Leading*

## THREADING TOOLS

When you buy GTD "Greenfield", you get a quality of product that comes from the world's largest, most modern threading tool plant and its research staff of threading engineers – PLUS SERVICE from the leading distributors and GTD "Greenfield's" field men in every industrial center.

**GREENFIELD TAP and DIE CORPORATION** GREENFIELD, MASSACHUSETTS

*Precision* THREADING TOOLS

# GEOMETRIC

## CLASS S Collapsing TAPS

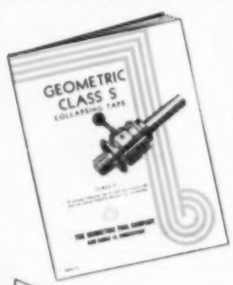
*A "Universal" Tap for Jobs Over 1¼"*

These famous Geometric taps not only fit almost any machine but will also do almost any internal threading job over 1¼" in diameter.

Finely proportioned, rugged in construction, and simple in operation, each GEOMETRIC CLASS S COLLAPSING TAP cuts such a wide range of diameters and pitches that it will often do the work of two competitive tools.

With a few simple adjustments and without buying additional parts, the S Tap can be converted to Stationary Type, Plate Trip — Rotary Type, Plate Trip — Rotary Type, Sleeve Trip — and Hand or Lever Trip. GEOMETRIC CLASS S COLLAPSING TAPS available for tapping diameters from 15/16 to 8½ inches. In addition to the standard line of S Taps, Geometric also builds many types of Special Taps. If you have a job requiring a Special Tap, put your problems up to Geometric. There's no obligation! *If you have an internal threading job over 1¼" send today for a free bulletin on these famous GEOMETRIC CLASS S COLLAPSING TAPS.*

**USE COUPON FOR FREE INFORMATIVE BULLETIN NO. S-3**




THE GEOMETRIC TOOL COMPANY
7 Valley Street
New Haven 15, Connecticut

Please rush me a copy of Bulletin No. S-3 which describes in detail the many advantages of the Geometric Class S Collapsing Tap.

*Name*_____

*Firm*_____

*Street*_____

☐ *Bus.* ☐ *Res.*

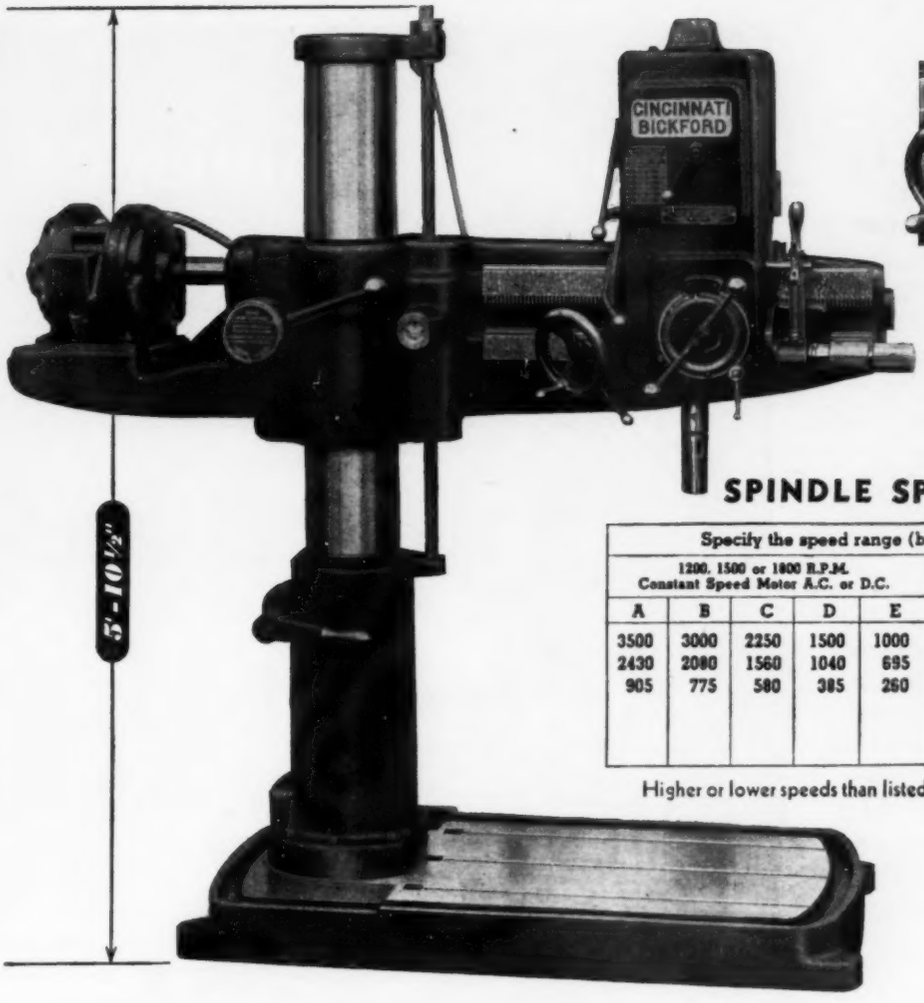
*City*_____ *Zone*____ *State*_____

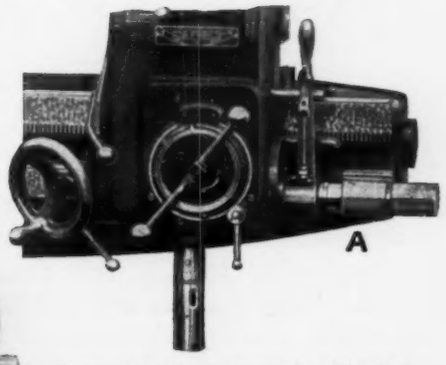
THE

GEOMETRIC

TO [illegible] N.

# Safe...Simple...Speedy




Hand wheel is operated by left hand while right hand (grip A) controls advance and return of spindles and automatically controls direction of spindle rotation.

## SPINDLE SPEED RANGES

| Specify the speed range (by letter) that meets your needs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1200, 1500 or 1800 R.P.M. Constant Speed Motor A.C. or D.C. | | | | | 900/1800 R.P.M. or 750/1500 R.P.M. Two Speed A.C. Motor | | | | |
| A | B | C | D | E | F | G | H | J | K |
| 3500 | 3000 | 2250 | 1500 | 1000 | 3500 | 3000 | 2250 | 1500 | 1000 |
| 2430 | 2080 | 1560 | 1040 | 695 | 2430 | 2080 | 1560 | 1040 | 695 |
| 905 | 775 | 580 | 385 | 260 | 1750 | 1500 | 1125 | 750 | 500 |
| | | | | | 1215 | 1040 | 780 | 520 | 345 |
| | | | | | 905 | 775 | 580 | 385 | 260 |
| | | | | | 450 | 385 | 290 | 190 | 130 |

Higher or lower speeds than listed above are available on special order.

New distinctive features which reduce mass production costs are found in this simplified high-speed Cincinnati Bickford 7½" diameter, 2½' arm Super Service Radial.

You save in power, floor space, and in initial investment. You get a machine, that gives the operator maximum ease and speed in handling.

The machine is sturdy, and will give continuous high production.

Write for Bulletin R-26A. It is completely illustrated and gives a complete description.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

*Equal Efficiency of Every Unit Makes the Balanced Machine*

**THE CINCINNATI BICKFORD TOOL CO.** **Cincinnati 9. Ohio U.S.A.**

# Skilled hands do more when you give them this extra muscle

Thousands of jobs become easier, faster, less costly with Kellerflex. For these most versatile machines supply powerful, mechanical muscle with fingertip control. They'll shape and finish dies and molds, even after hardening . . . finish stainless steel welds . . . bur, file, sand, grind, brush or polish *anything*.

Fourteen carefully engineered Kellerflex models and an almost infinite variety of attachments, accessories and tools are available. Among them, you'll find the combination perfectly suited to your particular requirements.

Write today for your copy of the latest Kellerflex catalog. Or, better yet, take advantage of our bur demonstration service. If you have a burring problem on a tough material . . . send it to us. We have facilities in our West Hartford plant for duplicating your shop setup, studying your job, and submitting a thorough report. Ask the Kellerflex experts how to finish it. No obligation, of course.

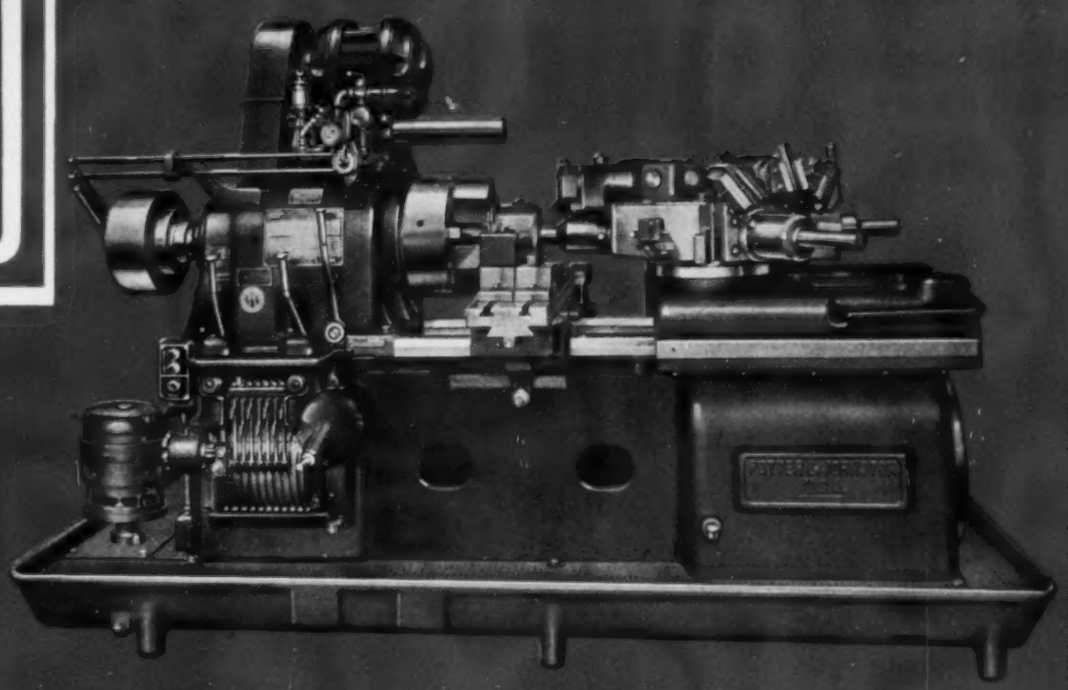
**PRATT & WHITNEY**
***Division*** **Niles-Bement-Pond Company**
**West Hartford 1, Conn.**

## Pratt & Whitney Kellerflex

FLEXIBLE SHAFT MACHINES, ATTACHMENTS AND ACCESSORIES

**"THERE IS NO BETTER-PAYING INVESTMENT THAN THE RIGHT TOOLS FOR THE JOB"**

# 5D



# THE 5D POWER-FLEX

## *is an important P & J contribution to lower production costs*

Great flexibility and high productive capacity are combined in this powerful, rigidly designed automatic turret lathe. Four automatic changes of spindle speed while under cut are provided. Other features contributing to its outstanding performance are: automatic binding of turret following index; a powerful, direct cross slide action and a constant high speed rapid traverse motion to the cross slide and turret slide.

The 5D Powerflex is provided with 20 changes of speed between 16 and 304 rpm, arranged in 5 sets of 4 automatic changes. This machine is available in four models: 5D (Standard), 5DE (Elevated), 5DLX (Long Travel and Extended) and 5DELX (Elevated Long Travel and Extended).

A high speed model is available with a maximum spindle speed of 443 R.P.M. Ask P&J Methods Engineers to give you an idea of the tooling flexibility of this machine so that you can determine its cost cutting possibilities on your work.

*For more complete information send for catalogue 139*

**CONDENSED SPECIFICATIONS (5D) STD.**

Swing over bed: 25"—Cross Slide Travel (each way) 5"—
Swing Over Cross Slide: 12"—Turret Faces: 5 (4 & 6 special)

**OTHER P & J AUTOMATIC TURRET LATHES**

Model 3U
(Swing over cross slide: 9½")

Model 4D
(Swing over bed: 21")

Model 5D2
(2 spindle swing. Limited by spindle to spindle center line distance. 10½"-15½".)

Model 6DRE
(Swing over bed: 34")

Model 6DS
(Swing over bed: 34" and 40")

Model 8DT
(Swing over bed: 36")

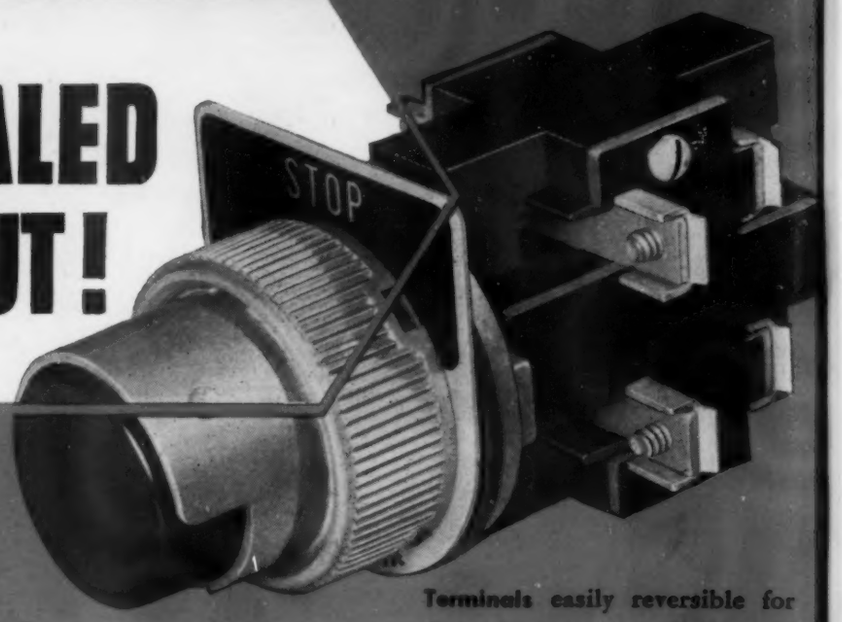
**POTTER & JOHNSTON COMPANY** PAWTUCKET, RHODE ISLAND

Subsidiary of **Pratt & Whitney** division Niles-Bement-Pond Company

YOU CAN BE SURE IF IT'S Westinghouse

OIL...
COOLANT...
CUTTING
COMPOUND
WATER

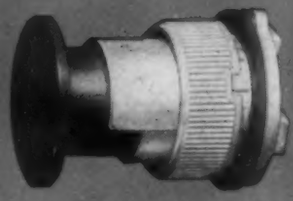
# SEALED OUT!



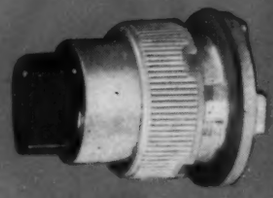

**Double-Pole, Double-Throw Contact.** Contact blocks are also available with single-pole, double-throw contacts; double-pole normally open contacts; and double-pole normally closed contacts.

**Terminals** easily reversible for front or rear connection.

**Coin Slot** cannot be punched accidentally, requires no special key, operates with a coin or screw driver.



**Mushroom Head** has large surface area . . . can be operated with gloves or palm of hand—ideal for emergency stops.



**Selector Switch** is suitable for combination with all contact closer blocks. A variety of cams permits latitude in circuit selections.

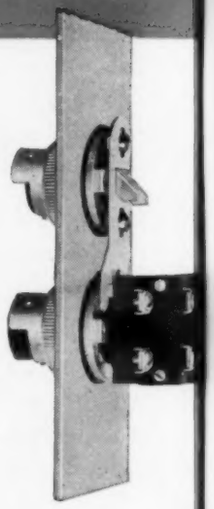
**Select-O-Push** combines pushbutton and selector switch in one unit . . . increasing design flexibility.

## WESTINGHOUSE OIL-TITE PUSHBUTTONS
### FOR POSITIVE OPERATION

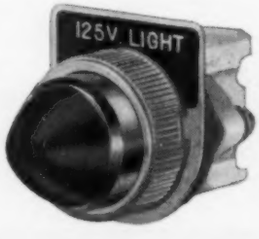
Eliminate the possibility of production breakdowns due to faulty pushbutton performance. Step up the efficiency and dependability of your machines by using Westinghouse Oil-Tite Pushbuttons. They work every time! Machine-fitted parts *plus* a rawhide seal prevent seepage of oil, coolants and other liquids from fouling the contact-making parts. Trouble is "sealed out!"

This new line of Westinghouse Oil-Tite Pushbuttons fits a wide variety of applications with standardized components. All necessary combinations of contact blocks, operators and a large selection of legend plates are available. For complete information call your nearest Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60664



**Two-Button, Maintained-Contact Assembly.** "ON" button remains closed until "OFF" button is pressed. This releases "ON" button, opening circuit. Note that the button stays "put", making the assembly self-indicating.




**Pilot Lights** harmonize in size, appearance and construction with pushbuttons. Variety of lens colors. Navy-type shock resistant.

**AMPLE STOCKS, ALL STYLES NOW AVAILABLE.**

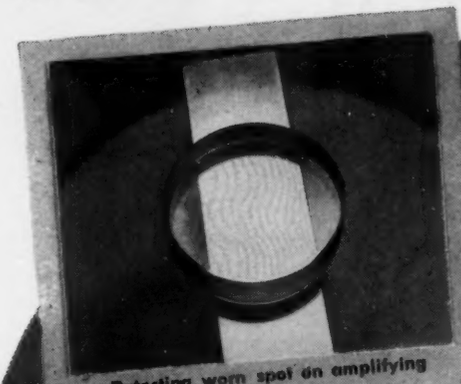
Meet automotive machine tool electrical specifications as developed by the joint committee of the automotive and machine tool industries.

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

OIL-TITE PUSHBUTTONS

# Van Keuren

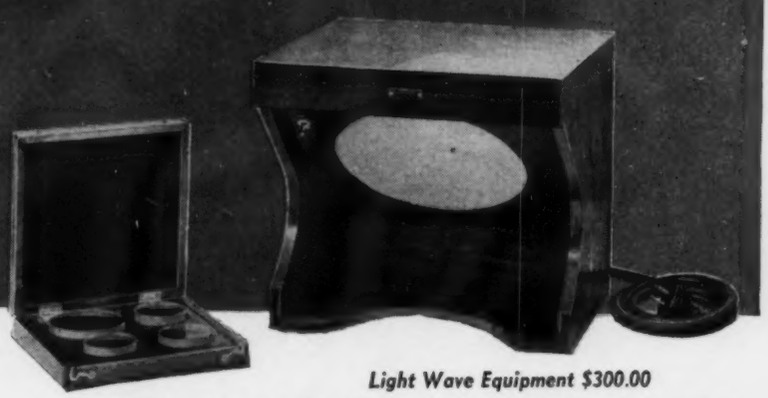
# LIGHT WAVE EQUIPMENTS
## are the proof of Precision



Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

Checking the flatness and parallelism of a micrometer anvil and spindle with a 1¼" diameter Van Keuren Fused Quartz Optical Parallel.



*Light Wave Equipment $300.00*

**Twenty-eight years ago, when the Van Keuren Light Wave Equipment was introduced to American Industry, measurements in Millionths of an inch seemed visionary and unnecessary. Today's and tomorrow's production requirements are specified in Micro-inches (millionths of an inch) and the ability to measure in these units is no longer visionary but a *must*.**

**The Van Keuren Light Wave Equipment includes a set of 4 self-checking double surface FUSED QUARTZ optical flats and an improved, instant starting 60 cycle 110 volt, minimum heat monochromatic light (light of one wave length or color).**

**Fused Quartz is highly transparent. It is extremely hard and has exceptional wearing qualities. It is free from strain and will not change its shape with time. Its expansion and contraction due to temperature change is less than that of any other known material. It is an ideal material for optical flats.**

**Insist on having Van Keuren optical flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.**

**Every plant that uses amplifying gages, measuring machines or gage blocks should have a Van Keuren Light Wave Equipment for the maintenance of these expensive tools. The equipment will instantly detect worn spots and grooves in anvils and measuring contacts, which if are not known will lead to false results. The equipment will check the flatness, parallelism and make size comparisons of gage blocks in one operation, and with elimination of temperature errors. Full instructions showing practical applications are supplied with each equipment.**

*The VK Catalog and Handbook No. 34 is a 208-page manual, indispensable for engineers, designers, inspectors, toolmakers and machinists.*

*It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines, serrations and worms.*

*It is the only book which gives the new accurate formulas and tables for measuring the pitch diameter of screw threads. The information on this subject is epoch-making in character.*

*It includes a new method for measuring the included angles of screws and a new method of inspecting flat ring surfaces with light waves and a wealth of other hard to find and valuable information.*

*Write today for your copy.*

**THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.**

**29th YEAR**

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

Remington Rand

MACHINES FOR MANAGEMENT

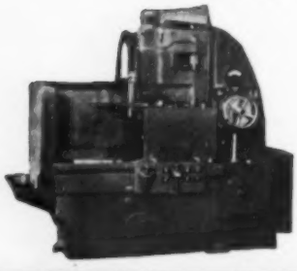
WATCHMAKER PRECISION characterizes every phase of Remington Rand's activities . . . PRECISION in advanced engineering . . . PRECISION in manufacturing hundreds of thousands of intricate assemblies to serve the world's business.

# they PUT IT ON THE BLANCHARD

**THE JOB:** GRINDING BOTH SIDES OF PRINT WHEELS — TO LIMITS ±.00025". Material is No. 1010 Steel — 2.660" diameter x .100" final thickness. Stock removal per side is .009" to .013".

**THE METHOD:** *Remington Rand Engineers chose a No. 18 Blanchard Surface Grinder* . . . 113 print wheels are simply and quickly placed on the 36" magnetic chuck. . . .

**THE RESULT:** *which of course governed the choice of the most suitable machine* . . . two chuckloads or 226 accurately sized pieces (452 surfaces) per hour. Difficult grinding jobs are made simple with Blanchard Grinders.



Whether your flat surface grinding job is simple or seemingly difficult, Blanchard Engineers will gladly assist you in arriving at the most profitable solution. Avail yourself of this free, non-obligatory service.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

# *exceptional* tool life....

## roughing and finishing

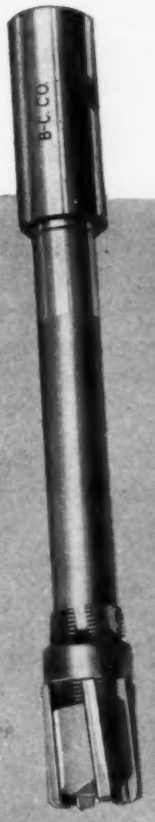
*with*

**BARBER-COLMAN CARBIDE TIPPED REAMERS**

Vibration and end-play may vary from spindle to spindle on multiple reaming operations. Therefore, reamer design is even more important in controlling identical holes at each station. Barber-Colman Inserted Blade Reamers with carbide tips, used on this operation, are built with floating holders and magic-chuck drives. This permits reamers to seat themselves independently of machine conditions and produces accurate, straight, round holes.

Barber-Colman Reamers are made with irregularly-spaced blades to give smooth cutting action and finely finished work. This feature eliminates welts frequently caused by uniform spacing. Long tool life is assured with the rigid mounting provided by wedges and an adjusting collar which prevent any blade movement during reaming.

Consult Barber-Colman Reamer Engineers on your reaming problems. Quotations will be furnished on receipt of blue-prints and production requirements.



# Barber-Colman Company

GENERAL OFFICES AND PLANT 116 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

**JOB RECORD**

Operation — Ream valve tappet holes

Material — Gray cast iron

| | Roughing | Finishing |
|---|---|---|
| Feed — | 8.32" per min. | 16.6" per min. |
| Speed — | 81 SFM | 36 SFM |
| Tool Life — | 4000-5000 holes per sharpening | 16000 - 18000 holes per sharpening |
| Tolerance — | Size .990"/.991" | |

BARBER COLMAN

MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

# Rigid, Direct Camming .. Pick-off Cam Change

.....No complicated levers and adjustments

.....No inaccessible heavy cross slide drums

THE NEW BRITAIN MACHINE CO.

NB

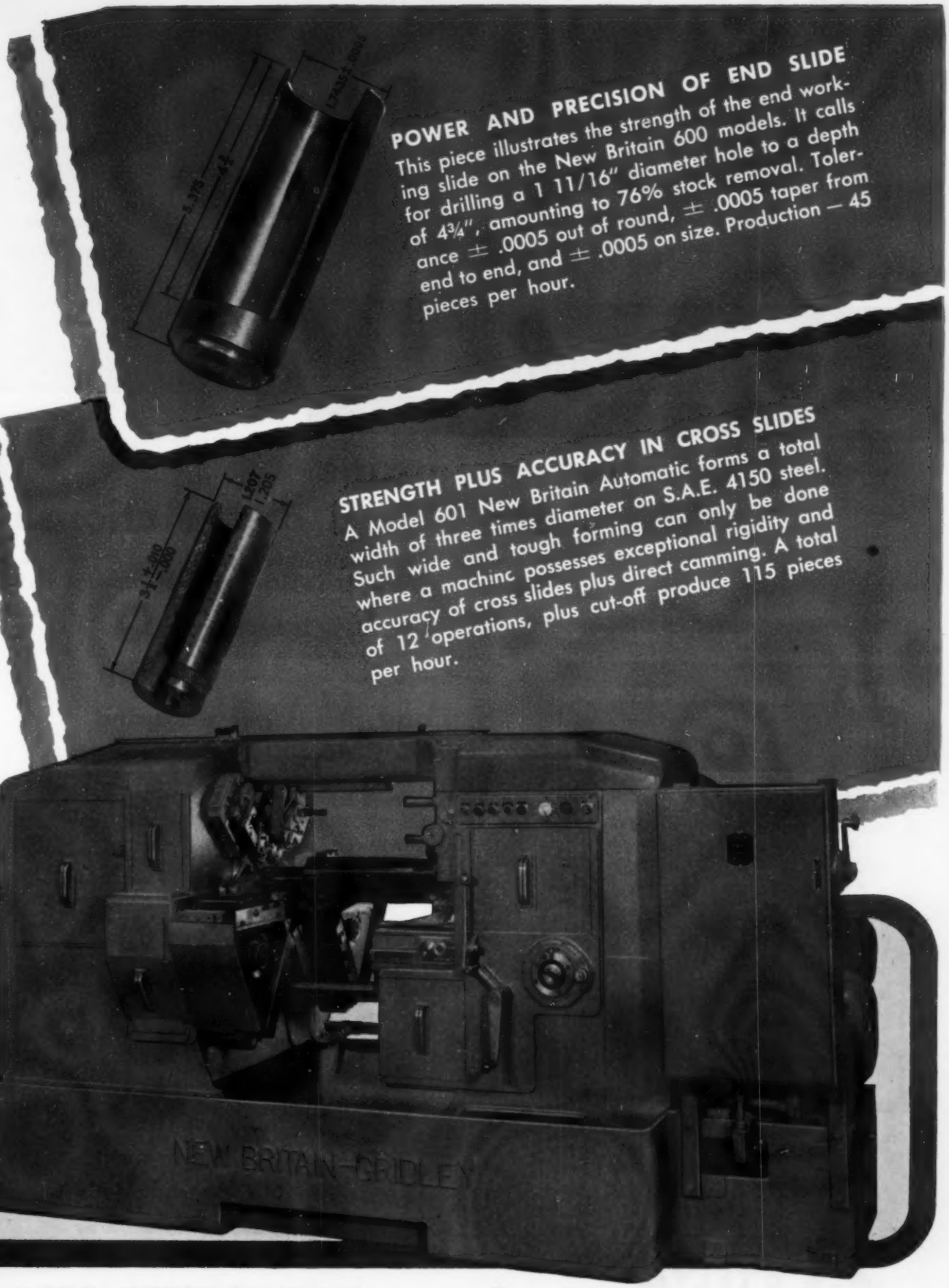
THE rigid, direct camming permits heavy, wide forming and rugged end-working cuts while maintaining accuracy impossible with indirect levers and linkages. This feature plus fast pick-off cam changes is the heart of the most efficient automatic built today—a NEW BRITAIN AUTOMATIC.

**FOR STRENGTH AND ACCURACY**
One to one ratio direct tool slide camming. When changing tool travel it is only necessary to change feed section. High point remains constant, eliminating need for change of tool slide stop. Cross slide cams are direct action disc type. Cam follower and shaft are both straddle mounted. Slides of special gibbed construction to prevent their coming away from ways on cuts taken away from slides.

**FOR QUICK, EASY CAMMING**
Light weight, one piece, easily stored disc cams require only the removal of a cover, lifting off one cam and replacing with another.

Would you like to get down to cases on the cost saving advantages of New Britain Automatics? Ask for the folder "It Can Be Done." It gives the facts on many specific jobs, some of which may indicate how you could find better ways of making the pieces you turn out.

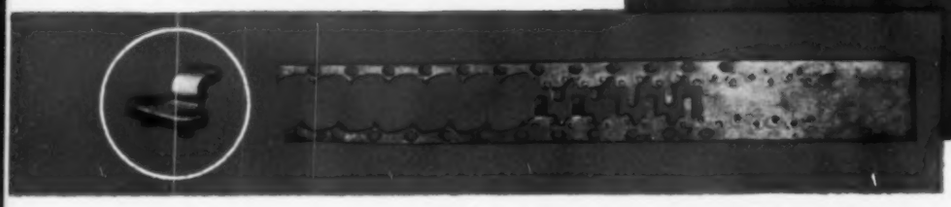
NEW


POWER AND PRECISION OF END SLIDE
This piece illustrates the strength of the end working slide on the New Britain 600 models. It calls for drilling a 1 11/16" diameter hole to a depth of 4¾", amounting to 76% stock removal. Tolerance ± .0005 out of round, ± .0005 taper from end to end, and ± .0005 on size. Production — 45 pieces per hour.
STRENGTH PLUS ACCURACY IN CROSS SLIDES
A Model 601 New Britain Automatic forms a total width of three times diameter on S.A.E. 4150 steel. Such wide and tough forming can only be done where a machinc possesses exceptional rigidity and accuracy of cross slides plus direct camming. A total of 12 operations, plus cut-off produce 115 pieces per hour.
NEW BRITAIN-GRIDLEY

# BRITAIN *Automatics*

THE NEW BRITAIN MACHINE COMPANY • NEW BRITAIN-GRIDLEY MACHINE DIVISION • NEW BRITAIN, CONN.

# 10,800 Stampings per hour using DANLY *Precision* Die Set



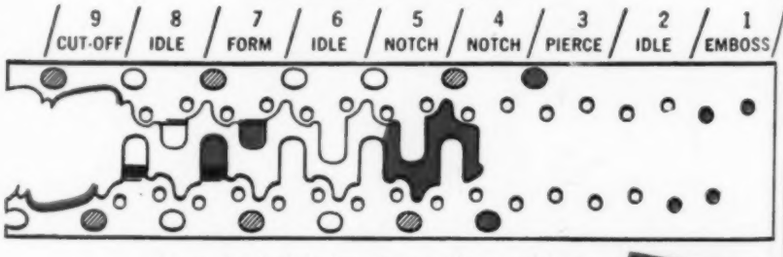
## two post set maintains accurate punch and die relationship

This 9-station progressive die setup produces two small offset brackets at a time from AISI-1008 steel strip stock $1\frac{9}{16}''$ x .071" at a press speed of 90 strokes per minute. The press delivers a gross production of 10,800 pieces per hour. A Danly all-steel two-post precision die set maintains tolerances of + .002" on the depth of the offset. Depth of embossing is held to .005".

### 250,000 pieces per die grind

On a total production of 750,000 pieces, an average of 125,000 strokes or 250,000 parts has been obtained per die grind. The precision built into Danly Die Sets (leader pins and bushings are held to limits of .0002 of an inch) helps you obtain a longer die life and lower stamping costs. Get top performance—specify Danly Precision Die Sets for every job. They're available for any type of press operation.

**OPERATION CHART**

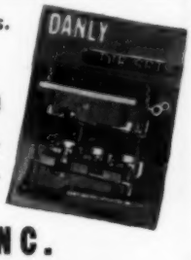



*Note:* Shaded holes show pilot positions.

**save time** — USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Use Danly's specialized service to save time and money. Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit your specifications.

- ★ **Chicago 50,** 2100 S. 52nd Ave.
- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- • **Milwaukee 2,** 111 E. Wisconsin Ave.
- • **Philadelphia 44,** 18 W. Chelten Ave.
- ★ **Rochester 4,** 16 Commercial St.




**Write for this *free* bulletin**

Illustrates how Danly's machining and welding service for special die sets will help you save additional time and money.

**DANLY**

**DANLY MACHINE SPECIALTIES, INC.**
2200 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS, STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT

# SPOT NEWS OF METALWORKING

**Fifty-six million dollars worth of machine tools** will be purchased in the U.S. by European countries with ECA funds between now and next July 1. ECA money will be used also to buy $50 million of machine tools in Britain. An additional $10 million will be placed with various European builders.

**Press forging of crankshafts in a completely conveyorized plant** is getting under way at Harvey, Ill. Blanks are preheated in oil, then heated to forging temperature by induction, blocked, forged and hot trimmed. All transfers are automatic.

**Foremen should not be burdened with paperwork,** such as planning reports, according to concensus at SAE Production Clinic. They should be left free to do their primary job of supervising their department.

**A tractor train is used by one metalworking firm to transfer work between departments.** Loads left at specified points are picked up hourly by the train and dropped at the right department, from which they are handled by departmental trucks.

**Bids for a mammoth 65,000-ton press** will be taken soon by the Air Force. The press probably will be installed at an Adrian, Mich., plant and will take many months to build. Much subcontracting will be done by the prime contractor because of the size of the job.

**Customers of a prominent steel company have helped to finance** construction of new melting capacity in return for the chance to get a share of the added steel tonnage.

**Pittsburgh steel mills are delivering sheets by truck** to Detroit users in twelve hours.

**About $9.7 million is specified for tools and machines in military order** totaling $28 million for development work on Continental's line of air-cooled motors.

**Non-farm employment broke all records in September** when it hit 45,864,000 and it is expected to go higher before the year ends. Factory employment of 16,638,000 was almost half million above last September. Employment in the machinery industry, including electrical, showed a seasonal rise to 2,290,000, but this was slightly below total of year ago.

**Average hourly earnings for factory workers rose slightly in September** to $1.36 an hour. Weekly earnings were $54.06 for an average week of slightly under 40 hours.

**Restoration of the biggest blast furnace in Russia's** Dzerzhinsky Iron & Steel works, demolished by the Nazis, has been completed and will boost the mill's output about 50 percent.

**Australia is canvassing metalworking** concerns to determine what kind of war material they can now produce, how much and how soon. Officials believe it would take 12 months to regain the 1943 production level.

**French metalworking is reliably reported next to strike.** Additional funds from Cominform have been received, private sources claim, sufficient to continue industry-by-industry operations but not a general strike.

# Gaging Metalworking

**The unexpected outcome** of the presidential election will not have any perceptible influence upon metalworking operations in the weeks just ahead.

► If anything, the inflationary effect of the Truman policies is likely to give more zip to metalworking production next year than it otherwise might have. That will be especially true if the nation's armament program should be enlarged. And chances of enlargement, in the direction of lend-lease to western Europe, appear good.

### Big Demand for Consumer Goods

Consumer goods' pipelines are rapidly being filled, and some already are full, but retail demand continues brisk. Manufacturers are confident that sales and production will stay at a high level indefinitely; they are making plans accordingly.

► Automobile companies feel that their market will be lush for many months, probably throughout 1949. A similar optimism exists in the tractor and farm implement field.

Business is going along at a remarkably good clip in a number of industrial machinery lines. Inquiries are numerous. To illustrate: makers of textile machinery have backlogs stretching over the next year or two. Canning machinery builders are so busy that they have had to farm out a considerable chunk of work.

Electrical machinery companies report operations well sustained. Their new orders are holding up well, too. Manufacturers of construction machinery say that business is far above the prewar level and that the outlook is good.

### ECA Buying Felt

ECA has announced allocation of $116 million for machine tools to be bought by western European countries before next July 1. Some $56 million is earmarked to be spent with U.S. builders and $50 million with the British. The American industry is not too happy over the generous share going to the British industry, which is one-third the size of ours and is loaded with orders.

Bookings from European users have risen. One builder alone, to illustrate, has received orders for 12 machines. This business originated in France, Italy, Switzerland, Holland and England. Many builders, however, take a dim view of export possibilities, aside from ECA-stimulated jobs. They point to: 1) lower prices of foreign-made machines, 2) ability of other countries to buy machines outside the U.S. without depleting the prized but meager dollar supply, 3) desire to stimulate inter-country trade in Europe, 4) growth of machine tool manufacture in Europe—Italy, Belgium, France, Sweden—and in Britain.

### Detroit Not Buying

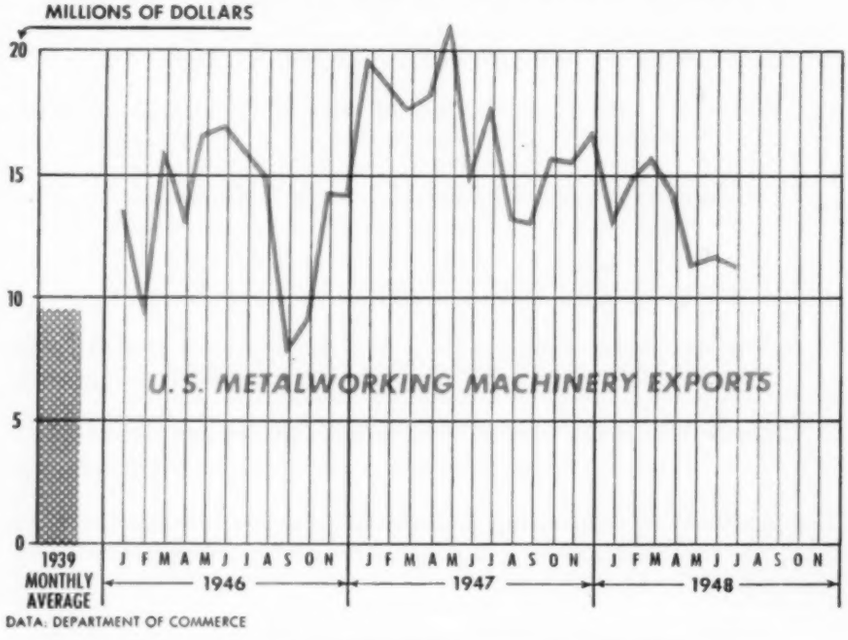
Detroit is relatively a poor source of machine tool business currently. One good reason: shortage of steel has kept automobile companies from operating at the high sustained rate for which they had tooled their plants. Thus they have not been able to make some of their new production machines pay off. So why buy a lot more until they can use what they have to full advantage?

Despite this drawback, the automotive field is yielding a limited amount of business, mostly special machines. It is believed that Ford soon will be placing orders to fill in weak spots in its line. A number of companies have orders for Chevrolet's tooling program on the new automatic transmission.

### Railroads Buying Machines

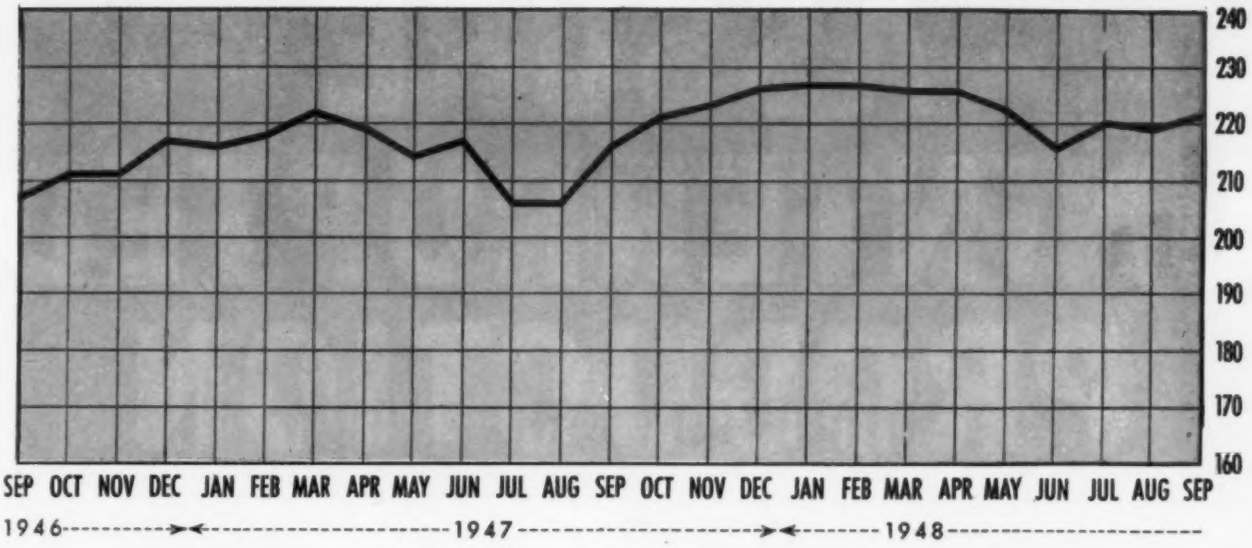
The railroad industry, long looked upon as a repository of some of the oldest machine tools in the country, has become active again as a buyer. Orders have been coming from the diesel locomotive manufacturing field and from railroad shops themselves.

### • Metalworking Machinery Exports to Rise




*Although exports of metalworking machinery slipped in July to $11,476,781 from $11,903,060 in June as progressively larger figures are anticipated during the remainder of the year and the first half of 1949 as ECA orders are filled. The last half of 1949 should show even larger increases. January shipments totaled only $13.4 million.*

## American Machinist INDEX OF METALWORKING PRODUCTION




| INDEX | | COMPONENTS | | | | |
|---|---|---|---|---|---|---|
| | | MACHINERY | ELECTRICAL MFG. | AUTOS, TRUCKS | TRANS-PORTATION EQUIP. | OTHER METAL-WORKING |
| Sept. 1948..... | 222 | 249 | 231 | 227 | 308 | 154 |
| Aug. 1948..... | 219 | 247 | 225 | 224 | 306 | 146 |
| Sept. 1947..... | 216 | 240 | 234 | 225 | 268 | 145 |

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

Maytag has yielded substantial orders in recent months—in machine tools, welding machines, presses, materials-handling equipment — for its new washing machine plant.

### Trucking Business Booms

Cost-conscious shippers in metalworking are swinging sharply from the railroads. After a series of postwar hikes in rail freight rates, and with the end of freight absorption by steel companies, shippers are switching more and more of their business to trucks and water transport.

Already the shift is showing in statistics. Through the middle of October, total carloadings for 1948 were running almost 3.5% below a year ago. In the week ending Oct. 16 alone there was a 4.2% drop under the corresponding week of a year ago.

Part of the decline in total carloadings can be explained by a reduction in coal operations and shipments, and by smaller grain and coal shipments to Europe. But one of the major drops came in less than carload shipments of merchandise. That's the category that includes much of metalworking's products. And it is down 9.6% from a year ago.

Truckers meanwhile show a whopping gain in business. The volume of freight they carried in August was 7.9% higher than in July and 18.9% above a year ago. Those are figures of the American Trucking Association. Their index of tonnage carried stood at 237 in August, as compared to 196 a year ago and 100 for the 1938-40 average monthly tonnage.

### Lead Price Boosted

Metalworking firms can expect another boost in copper alloy prices before long as the result of a 2-cent increase in the cost of lead and an exceptionally strong zinc market which may spurt upward soon. Copper supply is declining, output at Kennecott's Utah property having been cut by strikes.

The government has started negotiating with private producers to ship copper for stockpiling. When this starts, the already limited supply will be cut more sharply. Quicksilver jumped $1 a flask and throughout the whole non-ferrous market strong prices and limited supply have put the industry on edge.

### Foundry Equipment Slow

The index of foundry equipment orders, which hit the years high in July, continued its August drop through September. Based on 1939-100, the index touched 273.7 in September as compared to 324.7 in August and 456.3 in July. Shipments, however, continued to run in September comparable to those of August.

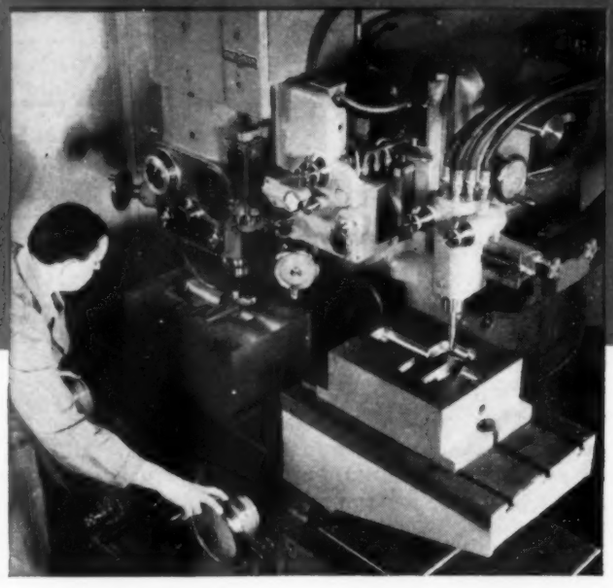
### Scrap Steel Easier

A rising flow of foreign scrap steel and concerted efforts in this country to keep scrap metal from piling up have stabilized the scrap steel industry to a great extent. With the steel mills operating at near peak capacity scrap dealers are having little difficulty in selling the metal but pressure on prices is at a minimum indicating the shortage is lessening. Most of the industry is now concentrating on building large stockpiles as a cushion against the winter months.

Little relief is felt in the sheet steel market despite booming output and mills are feeling increased pressure as industry's hopes rise with the mounting steel output.

# ASSURE UNINTERRUPTED PRODUCTION

**Prevent rust and sludge in hydraulic systems by using Texaco Regal Oils (R & O)**



WHEN rust and sludge form inside your hydraulic mechanisms, stoppages — sudden, unexpected and costly — are almost certain. So stop these trouble-makers before they start by using *Texaco Regal Oils (R & O)* in your hydraulic systems. You'll assure smooth, uninterrupted production and lower maintenance costs.

*Texaco Regal Oils (R & O)* keep hydraulic systems clean because they're turbine-grade oils with special additives to inhibit rust and oxidation — and specially processed to prevent foaming. You can get them in the correct viscosity for your equipment, whatever its type or size . . . and they'll give you longer service life than uninhibited oils.

Leading manufacturers of hydraulic equipment either recommend or approve *Texaco Regal Oils (R & O)* . . . and many ship their units charged with them.

Let a Texaco Lubrication Engineer help you get maximum efficiency and economy from your hydraulically operated machines. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

**TEXACO Regal Oils (R&O)**

**FOR ALL HYDRAULIC UNITS**

Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

# Moonshine Economics

A METALWORKING company and its local union recently signed a profit-sharing agreement covering its employees.

Buried in the contract was this extraordinary provision:

"It is agreed that the purchase of new machinery and equipment shall not affect the employees' share (of profits)."

This sort of reasoning is moonshine economics. It indicates that this company's employees have no conception of the importance to them of up-to-date machinery on which to work.

Purchase of new production equipment is recognized, and always has been, as part and parcel of the cost of doing business. A written agreement denying the fact does not abolish the principle. The contract penalizes management for being wise enough to keep ahead of competitors. It invites retention of obsolete machines—and eventual disintegration of the company.

Studies by various agencies show that our standard of living rises as the quality of our industrial equipment improves. They show further that the size of the workman's pay envelope and what that money will buy depends upon the kind of machinery used in the shop.

In these days of high costs, any company which continues to use old machinery is inviting trouble.

Employees who have won this new kind of contract should think over these facts:

1. Your management is paying you a high wage. The only way it can afford such a high wage is to get more productivity out of you. It can get more productivity from you, without your putting more physical effort into your work, only by installing new and more productive machines.

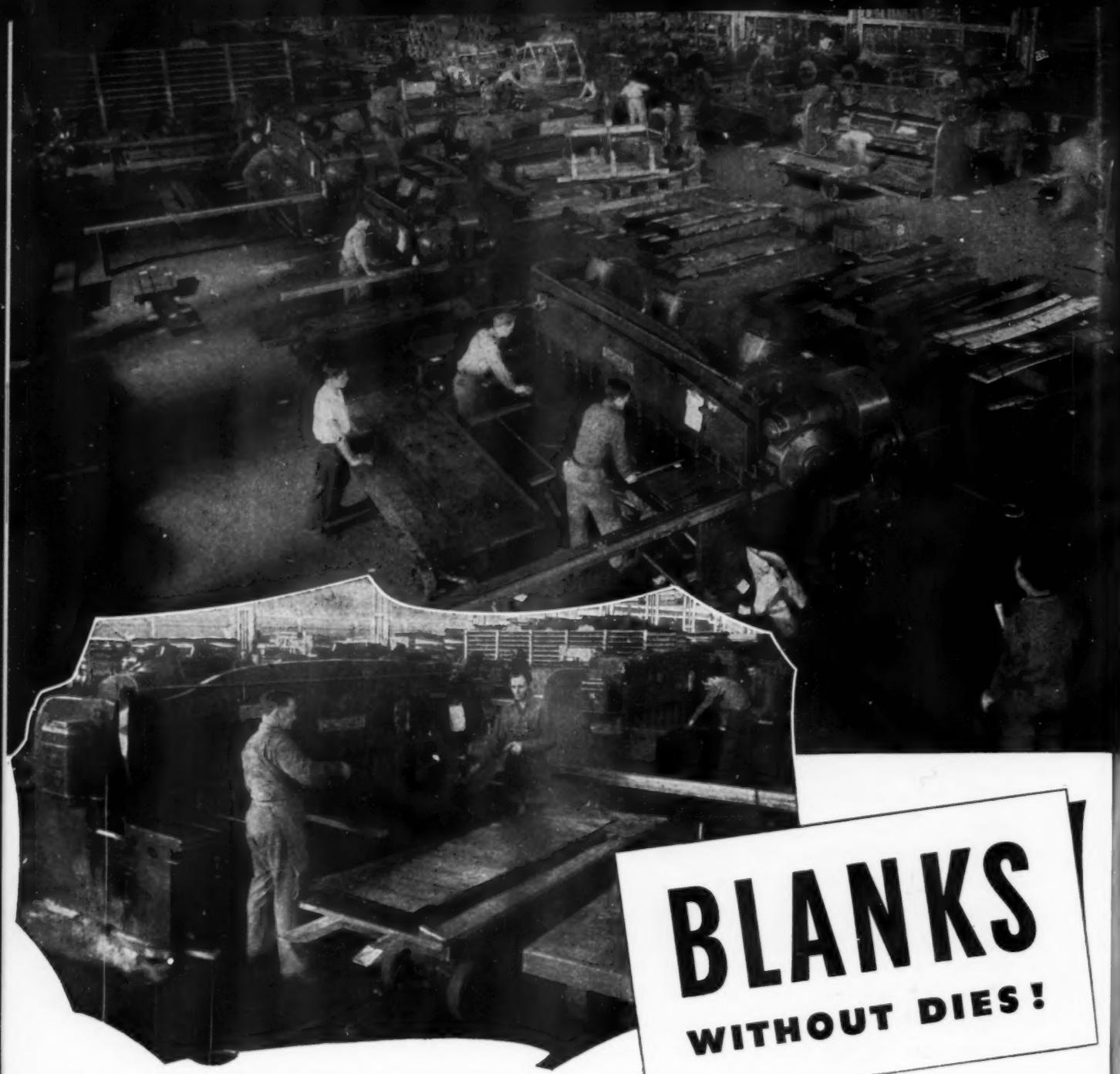
2. Greater productivity and the cutting of costs are twins. They go together. Your management must cut costs to make a profit today. If it doesn't make a profit, it has no earnings to share with you.

3. Constant replacement of old machinery is your friend because it helps you to produce more and to take home fat pay envelopes. It is to your interest that obsolete machines be replaced.

Any contract is vicious which brands the purchase of new machinery as a necessary evil. The contract in question should be scrapped and a new one signed which does not contain this distortion in economics.

Burnham Finney

EDITOR



# BLANKS WITHOUT DIES!

• *Courtesy—Central Steel and Wire Co.*

Cincinnati Shears have reduced costs sharply in the production of straight-sided blanks.

The exceptional accuracy of Cincinnati Shears—the ability to cut to thousandths of an inch—the ability to cut straight—all mean accurate, true blanks without dies.

The flexibility of Cincinnati Shears—the power to produce endless sizes of straight-sided blanks—the rapid, convenient gauging—all contribute to the cost reduction.

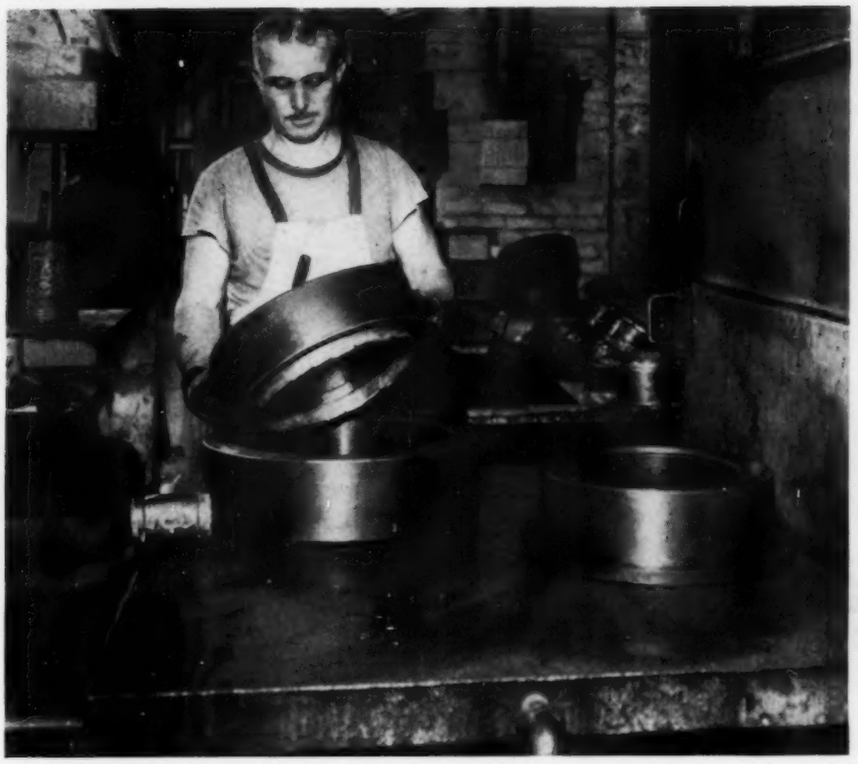
Our representative will be glad to discuss Cincinnati Shears with you.

Write for Catalog S-4 for a description of the Cincinnati Line of All-Steel Shears.

## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



***Mold lubricant...***
Silicone oils reduce flaking and cracking when mica is removed from the mold

# SILICONES...

## What They Are and What They Do

BY WILLIAM T. EVELETH, Chemical Department, General Electric Company

**Whether on jet planes or on baking-oven doors, these new compounds are out-performing previously used materials. For problems involving good physical stability at extremes in temperature, silicones may be the answer**

SILICONES are a group of synthetic semi-organic compounds that combine many of the more desirable virtues of organic and inorganic substances. Their basic chemical structure is a molecule consisting of alternating silicon and oxygen atoms. By itself this skeleton would be a purely inorganic, rigid substance such as sand or quartz. Accordingly, silicones, as a class, possess the high immunity to heat, cold, chemicals, and weathering that is typical of such rigid bodies.

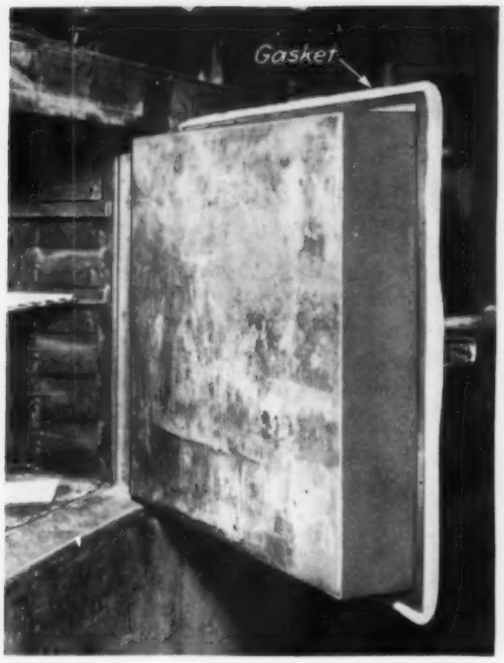
The addition of any one of a large number of organic groups to the silicon atom gives the flexibility and plasticity that is typical of organics and that is needed to make silicone substances workable in a variety of applications.

Silicone products are produced in a range from semi-volatile liquids to rigid solids and may be divided into four main classes: (1) oils and greases, (2) rubber, (3) resins, and (4) water repellents.

The process by which silicone products are made enables control over their composition such that within each of the four main classes there are various types of products. Each type possesses certain particular properties to a greater degree than other members of the class. Thus, each has a given set of operating requirements for which it is best suited.

### *Oils*

Silicone oils are clear water-white liquids made in viscosities ranging from that of a light machine oil up to those of semi-solid consistencies. Characteristics that make them attractive for appli-



***Gaskets and Packing . . .*** Silicone rubber on baking oven doors remains resilient for months at continuous temperatures of 400 F., and in turbo-superchargers retains its flexibility up to 520 F. As packing on the discharge valve seat of an electric hot water heater, silicone rubber increases the maximum temperature range. Natural rubber sticks to the surrounding metal at high temperatures

cations where conventional oils are unsatisfactory are:

(1) small change in viscosity from low to high temperature, (2) high temperature stability, (3) low pour point, (4) chemical inertness, (5) good electrical properties and (6) resistance to shear breakdown. Because of one or more of these characteristics, the oil is suitable for applications in the following fields: (1) as damping oils, dielectric fluids, and manometer fluids, (2) in hydraulic systems, (3) as lubricants, and (4) in condensation pumps.

### Damping Oils

The outstanding feaure of silicone oil is its small change in viscosity with change in temperature. This makes it an excellent oil for damping devices that must function in all kinds of weather. Such a unit is the aircraft shock absorber which must operate properly over a temperature range from +160 to —70 F. If the oil in the dashpot thins with heat the action will be too fast; conversely, if it thickens under cold, the action will be slowed. As the viscosity of silicone oil increases only 29 times over the given range as compared to a 400-fold increase for ordinary hydraulic oils, its advantage in this service is immediately apparent.

Other advantages that can be incorporated in a silicone oil for this application are non-volatility, high flash point (600 F), relative non-flammability, and long-time stability.

Because of this stability, plus its good electrical properties, the oil could be used as the dielectric fluid in oil-filled capacitors, and as the cooling oil in oil-filled transformers. It is particularly well-suited to high-frequency work because its power factor is low over a wide frequency range. Colored with soluble dyes, it may be applied as a manometer fluid.

### Hydraulic Systems

Because of their limited availability and high cost, silicone oils have not been used extensively in hydraulic systems as yet. Numerous tests, however, reveal the considerations that affect such applications. Among the advantages claimed are:

1. More constant performance over the operating temperature range.
2. Low pour point and starting temperature.
3. Lighter-weight systems possible.
4. Long oil life.
5. No sludges or decomposition products.
6. Less wear on pump parts (after modification).
7. Less viscosity change because of shear breakdown.

Its disadvantages are:

1. Pump lubrication more critical.
2. Greater tendency to leak through small openings, requiring carefully made joints.
3. Tendency to leach plasticizers from natural and synthetic rubber requiring selection of gaskets and seals of a formulation not affected by the oil.

It is anticipated that the oil may find important applications as a hydraulic fluid in aircraft, machine tools, hydraulic brakes, fluid couplings, and clutches.

### Lubricants

Oiliness refers to the ability of a lubricant to prevent seizing when a separating oil film is not main-

tained between the bearing surfaces. It is thought that chemically active constituents in the oil adhere to the metal surfaces and so protect them when the oil film is ruptured.

Because of its chemical inertness silicone oil is deficient in this property, particularly on ferrous surfaces. Such applications may require chemical modifications to improve lubricating characteristics. This is done at the expense of physical properties, such as the viscosity temperature relationship.

For many other combinations of metals, in sliding friction, such as aluminum on brass, silicone oils are found to be satisfactory. Hence, the properties of the rubbing surfaces, as well as of the lubricant are important in boundary lubrication, and care must be exercised in applying silicones for such requirements.

Similar results were obtained in tests on the load-carrying ability of small journal bearings. Ferrous combinations were low, others were reported by the Naval Research Laboratory as going as high as 6,000 psi.

Successful applications include a small d.c. aircraft motor and one for naval radar service—both of which require positive starting at —85F. Other equipment in which silicones are the lubricant are bomb-sight mechanisms, and metal-forming dies.

Silicone oils and greases applied as lubricants for molds in which rubber and plastic products are formed, resist decomposition under high molding temperatures. Sticking of the binder and the molded piece is prevented and there is less breakage when parts are removed from the mold.

In applications where a heavier-bodied lubricant is desired, such as the low-pressure laminating process, the semi-solid consistency of the greases is desirable.

### Condensation Pumps

Condensation pumps for the production of high vacua are coming into greater demand in commercial practice. Among the processes requiring low pressures are the molecular distillation of vitamins, vacuum tube manufacture, electron microscopes, mass spectographs, television tubes, and the production of metallic mirror coatings.

With silicone oil as the working fluid this application utilizes the high temperature stability and chemical inertness of silicone oil to obtain greater service life from the fluid and to eliminate valves and traps needed to avoid oxidation and sludging with other oils.

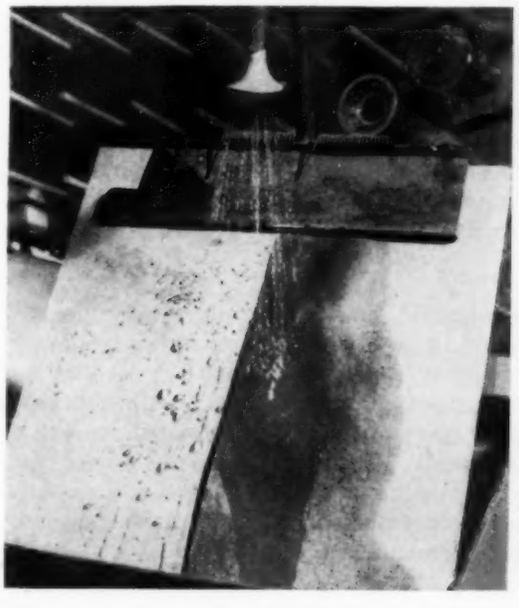
### Silicone Rubber

One of the most important members of the silicone family is silicone rubber. Its unique properties of high heat resistance, low temperature flexibility, and low permanent set, lead to its use as a gasket material in such diversified applications as (1) baking-oven doors, (2) high powered searchlights, (3) diesel engines, and (4) packaging equipment.

All grades of silicone rubber can be exposed continuously to temperatures of 300 to 325 F., with little increase in surface hardness, or decrease in flexibility or resiliency. Results are the same for short-time exposures up to temperatures as high as 520 F. Even at this temperature, there is no tendency towards softness and the rubber will not stick or adhere to metal surfaces.

These properties provide excellent gasketing action in baking and drying ovens. Gaskets operating continuously at 400 F. will give up to 18 or 20 months service. Thus, replacements are fewer, less time is lost, and maintenance costs are reduced. In addition, tolerances formerly required on the door and oven for other gasket materials can be widened when silicone rubber is used. Soft resilient stocks take up the irregularities between the two mating parts.

One of the first important applications for silicone rubber was the lens gasket on naval signal lights and searchlights. Protection of the lens from me-



***Water Repellents . . .*** Blotting paper, treated with silicone water repellent, sheds water without wetting. Similar results are shown on ceramic end plates. Treated parts are on the left in each case

**VISCOSITY-TEMPERATURE CHANGES IN SILICONE AND PETROLEUM OILS**

| TEMPERATURE DEGREES F | VISCOSITY, CENTISTOKES AT 100 F | |
|---|---|---|
| | SILICONE OIL | 100 V. I. PETROLEUM OIL |
| 210 | 40 | 10.8 |
| 100 | 100 | 100 |
| 0 | 350 | 11,000 |
| —35 | 660 | 230,000 |
| —70 | 1560 | ..... |

Outstanding physical attribute of silicone oil is its small change in viscosity with change in temperature. Comparison is between a typical silicone oil and a paraffinic petroleum oil having a viscosity index of 100

chanical and thermal shock was required from temperatures ranging from 400 F. to —40 F. Since the same silicone stocks that have high heat resistance, also remain flexible in applications as low as —55 F., silicone rubber produced better results than materials previously available.

Other gasketing jobs for which the properties of silicone rubber are desirable are found in stationary diesel engines, gas turbines, air compressors, turbo-superchargers, and the sealing of small liquid-filled capacitors.

This latter application makes use of not only the high heat resistance but also the low compression set, good dielectric properties, and the chemical resistance of silicone rubber. The absence of plasticizers in the rubber prevents contamination of the dielectric caused by leaching action on the gasket.

Silicone rubbers also make possible better oil seals around high-speed shafts. Conventional gaskets will swell in oil, friction is increased, and the resultant temperature rise may cause the seal to soften, stick to the shaft, and be torn apart. Silicone rubber also swells slightly, but its resistance to heat lessens the danger of trouble from increased friction. This property, plus the fact that it does not ordinarily adhere to plastics, cloth, glass, metal, or other material even at temperatures of 300 to 350 F. leads to its use as a press pad in packaging equipment utilizing heat-sealing plastic film or a plastic-film metal-foil combination. For the same reasons silicone rubber is used in pressing mica sections into thin sheets.

In the electrical field, it has numerous applications as an insulating material, including rubber-coated lead wires, glass cloth for slot cell insulation, and rubber-coated tape for coils.

Silicone rubber can be obtained as extruded shapes, molded parts, flat sheets, fabricated stock, or coated glass cloth. Adhesives for joining silicone rubber to itself or other surfaces are now available to extend the field of application.

### *Resins*

Silicone resins are particularly well adapted to insulating functions in electrical apparatus. In the form of varnishes they may be used to treat glass cloth or tape, asbestos paper or cloth, and for dipping and impregnating coils. Another application is the binding of mica flakes, although as bonding agents they are not as strong as other commonly used materials.

Their outstanding properties include high thermal stability, good dielectric properties, and resistance to moisture and some chemicals. In test, treated glass cloth samples were not affected by most alkalies and by many acids, including concentrated hydrochloric, nitric, acetic, and dilute acetic. Sulphuric acid, however, attacked and ruined the samples.

Although other considerations are near-limitations on machine ratings and must not be overlooked the increased thermal life of silicone-treated insulation offers several possibilities in machine design:

1. Reduction in size and weight.
2. Increased insulation life where present operating temperatures are maintained.
3. Operation at high ambient temperatures, which may be of value in boiler rooms or other hot areas.
4. Greater overloads for longer periods.
5. Improve the flame resistance of insulation.

This latter feature will be advantageous in marine, land, or air transportation where the hazard of fire is a danger to human life as well as machinery.

### *Water Repellents*

Silicone water repellents are a group of liquids and compounds that can be applied to ceramics, paper, viscose and acetate rayon, cotton fabric, wool, nylon, plastics, glass, quartz and leather to enable these materials to shed water.

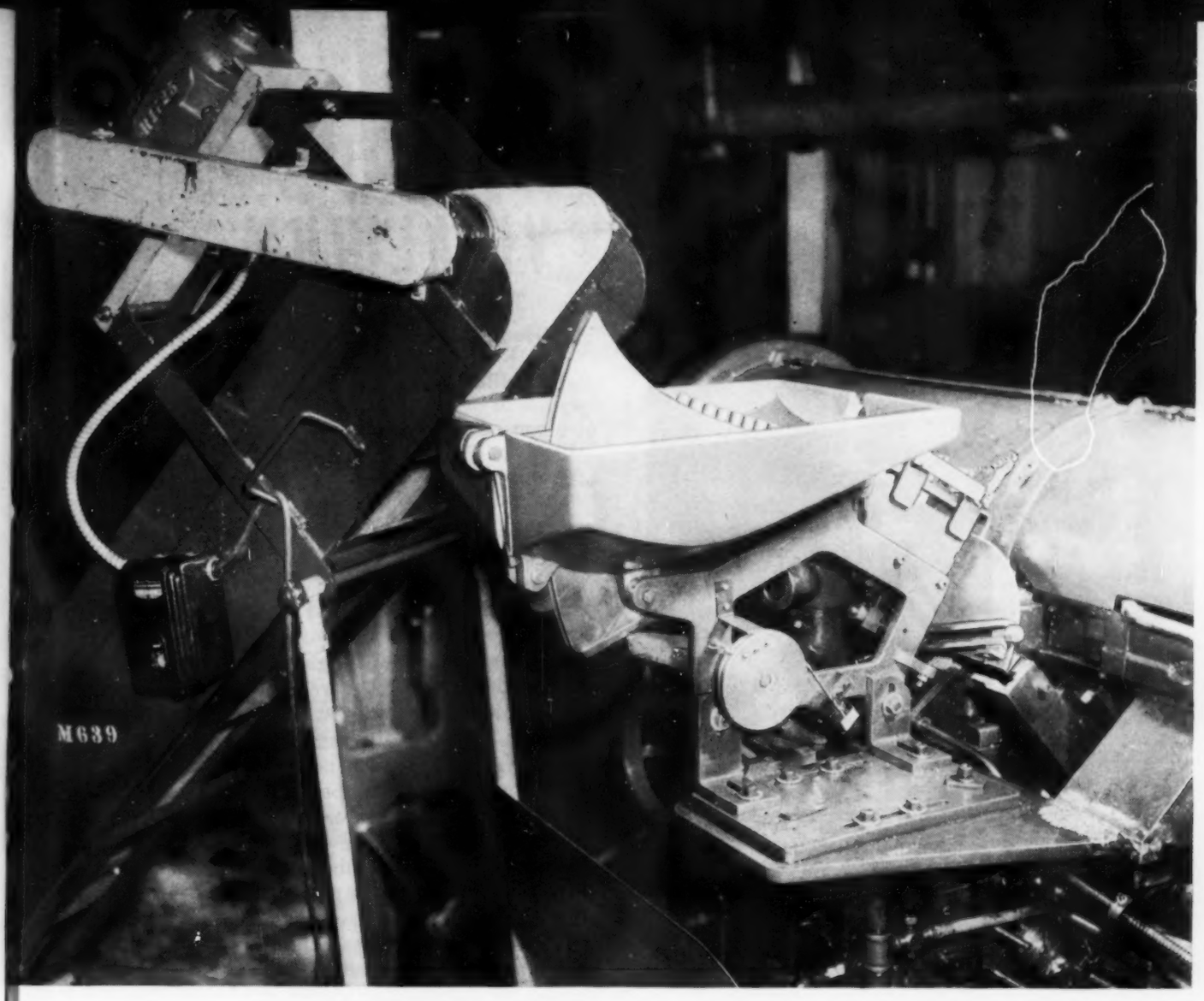
Vapor treatment of parts is carried on in an inclosed cabinet containing provision for vaporizing the silicone liquids and circulating the vapors. Fumes should not be breathed and care should be exercised to avoid contact of the chemicals with the skin.

Millions of steatite coil forms and components of radio transmitters have been protected against moisture by this means. Other uses include the glass amplifier tubes of hearing aids and certain fluorescent lamps.

In liquid form, water-repellent treatments have been used on glass to decrease the clotting time of blood and to keep the inside surface of glass flow gages free of contaminations.

### *Other Aspects*

Silicones should not be regarded as a panacea. They appear to possess many outstanding properties, particularly as regards resistance to heat and cold. Yet a great deal remains to be learned about them. Their successful application requires analysis and careful study. Their introduction into new fields should come about in an evolutionary manner, after thorough consideration of their merits for the particular requirements.




**Conventional screw-loading device,** operating off feeder arm of six-spindle Conomatic, is fed by portable conveyor for secondary operation on socket-head screw automatic

# Socket-Head Screw Finishing Mechanized

**Portable power conveyor, hopper feed eliminates manual loading to make work easier for operator and to reduce handling costs**

ELIMINATION of manual loading of socket-head screws on secondary operations has been accomplished at the Bristol Co., Waterbury, Conn., by a portable power conveyor and hopper feed on a six-spindle Conomatic.

Originally a hopper-feed system was devised to work off of the feed arm of the machine. However, it was necessary for the operator to lift heavy pans of screws at frequent intervals into the hopper. To put the machine on a fully automatic basis, a bin was attached to a Rapids-Standard Co. conveyor.

The bin is loaded, the screws carried into the hopper, then fed into the magazine of the machine one at a time. The magazine is partially filled by hand at the start of the operation so that if several screws during the run should fail to be picked up from the hopper the machine would continue to operate.

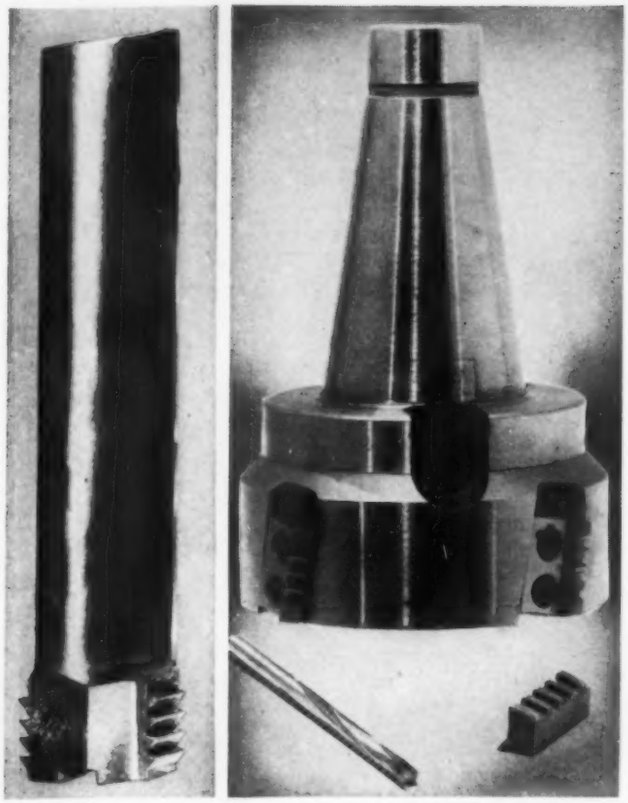
The socket-head screw is completed in two operations. In the bar machine the thread is cut, head knurled and the part cut off. In the secondary operation, the head is drilled in three stations, broached by a proprietary method and redrilled to clean out the burr produced in broaching.

# How to Machine VITALLIUM

**Usually considered non-machinable, Vitallium alloys for turbine blades can be successfully drilled and milled with carbide cutters**

BY JESSE SDANO

Tool & Maintenance Dept., General Mfg. Div.
ALLIS-CHALMERS MFG. CO.



**Gas-turbine blades,** precision cast from Vitallium and hand polished, have milled radial serrations on both sides of the root section, and a milled groove across the root bottom. Milling operations are performed by Allis-Chalmers with the cutter shown at right, which uses Carboloy grade 883 cemented carbide blades. Standard ¼-in. twist drills, tipped with the same material, are used successfully for drilling holes 1 3/16 in. deep

**Double-spindle** production milling machine is used for cutting serrations on each side of turbine blade root section and is equipped with exceptionally heavy and rigid milling fixture. It is essential that the blade be held perfectly steady to minimize cutter breakdown

RAPID development of the gas turbine has compelled industry to use the hard, tough, and extremely difficult-to-machine high-temperature alloys for turbine blades. Until very recently these alloys could be machined to shape only by grinding.

Vitallium, a high-temperature alloy formulated by the Austenal Laboratories, is being used by Allis-Chalmers for making gas turbine blades. It is also widely used for supercharger and jet engine blades. The alloy is composed principally of cobalt and chromium, with no tungsten and very little iron. Its machining characteristics are similar to those of the Stellite alloys, which are commonly shaped by casting and grinding.

Turbine blades made from Vitallium by Allis-Chalmers are cast to shape by the lost-wax process, and the company's precision investment foundry has found it possible to cast the blade air-foil contours with satisfactory accuracy. But some machining is necessary to finish the root serration profile within the extremely close tolerances required. Primary consideration was given the crushed wheel profile method of grinding the root serrations, but experiments with tungsten-carbide milling have proved that this method is economical and more satisfactory from a production standpoint.

Successful drilling and milling of Vitallium in the Allis-Chalmers shops is the result of an experimental program initiated some time ago. Initial phase of this program was to determine whether the material could be drilled, because the lacing-wire method of adding support to the spindle blade assembly was incorporated into the design of the turbine rotor for which the blades were developed.

Experiments were conducted with carbon steel drills of differing, special heat-treatments; with high-speed steel drills at various speeds and feeds; and with different coolants; but no successful method was determined for using such drills. Drilling was finally accomplished with carbide-tipped drills.

The drills used successfully were ¼-in.-dia. stand-

ard twist drills tipped with Carboloy grade 883 cemented carbide. With these drills, holes were consistently drilled through the vane sections of the blades, which was approximately 3/32 in. thick, and finally through the full thickness of the root, a distance of 1 3/16 in.

Tests indicated that the ¼-in.-dia. drill must revolve at approximately 255 rpm. with 0.003 in. per rev. feed to obtain best results. A constant mechanical feed is essential to overcome frictional work hardening of the alloy. It was found next to impossible to continue drilling in a hole in which a drill was allowed to dwell, even if only momentarily. While a variety of coolants were applied, it was found that they had little if any effect upon the success of the operation.

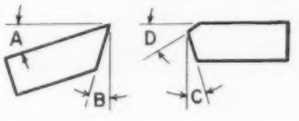
When studying the milling of Vitallium, several approaches were considered. To achieve data usable under production shop conditions, it was decided to use a production machine within the department where blade milling operations are normally conducted. A production-type milling machine, driven by a 10-hp. motor, was selected. As the blade had radial serrations, a radial milling attachment was mounted on the table of the machine. Cutters of the inserted-blade type were designed with removable insert supports, to make it possible to change the rake angles, helix angle, etc., with a minimum of cutter-body alteration.

While the milling cutters were being made, broaching trials were conducted on a radial broach employing a single cutter fed into a Vitallium block in such a manner as to simulate the action of a multiple-tooth cutter. Although 270 passes were taken at 0.002 in. stock removal per cut, the results were not conclusive, because progressive breakdown of the cutter caused excessive back thrust against the workholding fixture. It was found impossible to hold size in this experiment.

The method for milling the locating groove in the root of the blade was determined by using a production-type milling machine, a temporary holding fixture and standard 4-in.-dia., ⅜-in.-face, Wesson inserted-blade full side-milling cutter. Cutter widths were modified to fall within parts specifications. A 5° negative radial rake was provided to overcome excessive impact at the cutting edges. As a nonferrous cemented carbide gave the best performance during the drilling tests, a comparative grade, Wesson GI, was selected for the blades. A series of cuts 17/64 in. deep and approximately 1/32 in. on each side of the cast groove was taken. From these tests it was determined that the proper spindle speed was 60 rpm., or 62 fpm. surface speed for the 4-in.-dia. cutter, at 2 ipm. feed for full depth of cut. Conventional type milling was performed, without coolant of any kind.

With these tests completed, experiments were started on the milling of the serrations on each side of the blade root. The workpiece, a 3-in. cube of

## TEST RESULTS ON CARBIDE MILLING OF VITALLIUM




| Test No. | RPM | Surf. Ft. Per Min. | Feed Per Min. | Chip Load | Depth (In.) | Length (In.) | Width (In.) | No. Teeth | No. Cuts | TOOL ANGLES (DEG.) A | B | C | D | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 87 | 118 | 0.50 | 0.0028 | 0.090 | Just touched | 1¼ | 2 | 0 | 0 | 3 | 2½ | 0 | Not enough clearance—Regrind |
| 2 | 87 | 118 | 0.50 | 0.0028 | 0.060 | Just touched | 1¼ | 2 | 0 | 0 | 3 | 2½ | 5 | Not enough clearance—Regrind |
| 3 | 87 | 118 | 0.50 | 0.0014 | 0.060 | 3 | 1¼ | 4 | 1 | 10 | | 5 | 5 | Cut shiny but wavy |
| 4 | 106 | 144 | 0.62 | 0.0015 | 0.060 | 3 | 1¼ | 4 | 1 | 10 | 4 | 5 | 5 | Cutter burned slightly |
| 5 | 87 | 118 | 0.62 | 0.0018 | 0.060 | ¾ | 1¼ | 4 | 1 | 10 | 4 | 5 | 5 | Cutter burned and chipped—Regrind |
| 6 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1¼ | 4 | 5 | 10 | 4 | 5 | 5 | Cutter worn—Regrind |
| 7 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1¼ | 4 | 2 | 10 | 6 | 6 | 3 pos. | Cutter worn—1 tooth chipped 2nd cut—all teeth chipped and worn |
| 8 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1¼ | 4 | 4 | 10 | 6 | 6 | 0 | High sulphur coolant used—smoother cut—all teeth chipped |
| 9 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1¼ | 4 | 6 | 10 | 6 | 5 | 5 | Coolant used. Cutter worn on OD |
| 10 | 46 | 62 | 0.95 | 0.0051 | 0.060 | 3 | 1¼ | 4 | 8 | 10 | 3 | 6 | 5 | Cutter worn—2 teeth surface chipped as if from grinding |
| 11 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1 | 4 | 20 | 10 | 6 | 10 | 7 | Conventional mill dry—cutter in excellent condition |
| 12 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1 | 4 | 3 | 10 | 6 | 10 | 7 | Climb mill dry—cutter in good condition—pounds |
| 13 | 131 | 178 | 2.8 | 0.0053 | 0.060 | 3 | 1 | 4 | 1 | 10 | 6 | 10 | 7 | Conventional cut—all cutters chipped |
| 14 | 46 | 62 | 0.50 | 0.0027 | 0.060 | 3 | 1 | 4 | 2 | 0 | 5 | 10 | 7 | Cutter pounds—1 tooth chipped |
| 15 | 46 | 62 | 0.50 | 0.0027 | 0.140 | 3 | 1¼ | 4 | 3 | 10 | 6 | 6 | 7 | Serrations in cutter. Proved carbide will mill Serrations. Cutter ok |
| 16 | 46 | 62 | 0.50 | 0.0027 | 0.140 | 3 | 1¼ | 4 | 1 | 10 | 6 | 6 | 7 | All teeth chipped |
| 17 | 46 | 62 | 0.50 | 0.0027 | 0.140 | 3 | 1¼ | 4 | 4 | 10 | 6 | 6 | 7 | ⅛ in. flat on vertical part of tooth was rubbing |

**Data** obtained with different feeds, speeds, chip loads, and types of cutters, in milling experiments on 3-in. Vitallium cube. Various makes and grades of carbide were used in these experiments. Test No. 11 gave best results

cast Vitallium, was held in a vise mounted on the radial milling fixture. For these tests, the top spindle and cutter only were employed. A starting point of 87 rpm. (118 fpm.) at 0.50-ipm. feed, 0.090-in. depth of cut and 1¼-in. width of cut was established. The two cutter inserts were in the form of a rectangle, without serrations, and with zero radial and axial angles. Using these values as a starting point, a series of performance tests was run.

Test data obtained are shown in the accompanying table. It was immediately necessary to increase the number of blades to four and to establish a 10° positive axial rake angle, and a 5° negative radial rake angle. These alterations in the cutter were made to overcome excessive impact, by providing shear action at the cutting edges.

Comparative tests were made with various grades of cemented carbide, employing several combinations of speeds and feeds, depths of cuts, and coolants. It was interesting to note that while Vitallium would indicate a Rockwell C hardness of 30-32 before machining, work hardening during the milling operation increased hardness to 48-50 Rockwell C for a 0.001-in. depth.

Climb milling was attempted during the test in order to eliminate cutter contact with the work-hardened surface, but was discontinued since conventional milling was equally successful, all factors considered. It was found necessary to stop the cutters during the return stroke of the table, as scraping the edges caused them to break down rapidly.

The most favorable combination resulting from these tests is shown in the table for test No. 11. Spindle speed was established at 46 rpm. (62 fpm.), 0.500-ipm. feed, 0.0027-in. chip load, at 0.060-in. depth and 1-in. width of cut. Carboloy's grade 883 carbide was employed during this particular test. Serrations were then ground into the cutter inserts and identical trials were run, with complete success.

The blade milling fixture in the accompanying illustration was employed for production milling. This fixture had to be designed with sufficient mass to dampen vibration, and to provide sufficient clamping rigidity to overcome blade deflection inherent in a duplex-milling operation when the two cutters are not synchronized. The importance of clamping rigidity cannot be stressed too highly, because the scuffing action produced through blade deflection was found greatly to accelerate cutter breakdown.

While the greater number of trials were performed without coolant, it was found beneficial during production milling of the serrations to provide a coolant to minimize buildup on the cutting edges and improve tool life.

To insure against excessive wear of the cutter, a schedule was set up so the cutters would be removed from the machine for sharpening when 85 to 90 blades had been milled. This was necessary, because the generally accepted rule of applying 1/32 in. of peripheral land wear as the limiting factor did not work satisfactorily when milling Vitallium. Cutters kept in production for an extended period were found to fracture even before the usual land wear developed. A thorough examination of dull cutters was made before resharpening to guide design changes. This procedure helped to reduce cutter failures and resulted eventually in greatly extended cutter life for the operation.

## Tips FOR TOP SHOP MEN

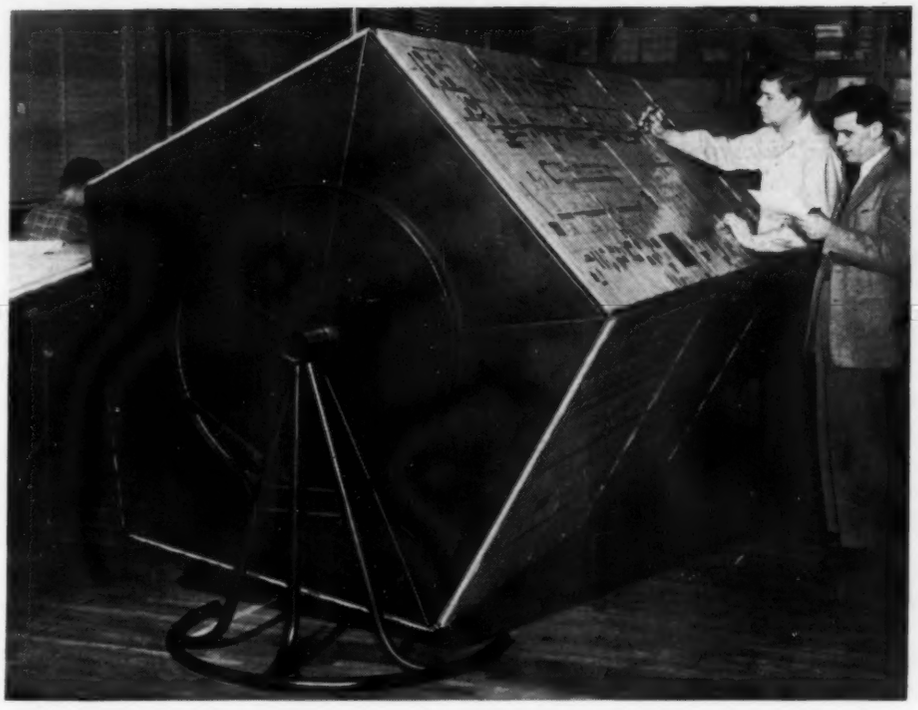
**264** Work with the young men who show sloppiness—it's usually too late to change the older ones. Lack of neatness frequently is reflected in lack of efficiency.

**265** Maintenance is most expensive when you skimp on it to save money. Lack of lubrication and painting forces more replacements than service or obsolescence.

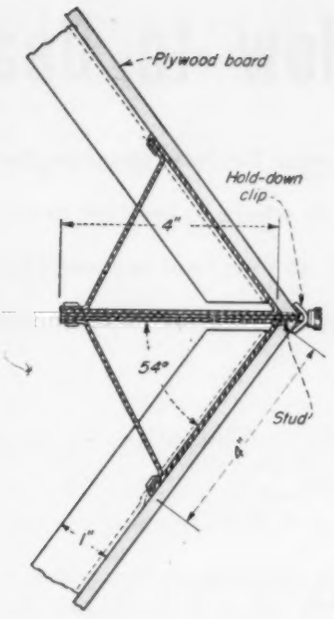
**266** Noise accelerates fatigue. Everything you can do to make operations quieter will help your production curve.

**267** What about power costs? Are your distribution systems for air, water and electricity wasting instead of conveying? Can your boilers be shifted from oil to coal if necessary? There's no point in saving at the spigot and wasting at the bung.

*"One thing I can't stand is a squeaky door!"*



**Pentagonal plant layout board** rotates on two ball bearings so each face easily can be brought into position for reference or for minor changes. Brake acting on 3-ft. ring welded to end plate holds board in any position




**Corner detail** shows how edges of side panels are joined to form pentagonal frame. 54° formed members run full length of panel and angle sections are welded on to give required width

# PENTAGONAL LAYOUT TABLE SAVES OFFICE SPACE

***Each Side of Welded Frame Takes Six Individual Layout Boards***

BY A. M. BOWERS, Works Manager, Indianapolis Works
Motor Truck Division, International Harvester Company

LAYOUT BOARDS for large single-story plants like the Indianapolis truck-engine works of International Harvester Company usually cover considerable area, even when the conventional ⅛- or ¼-in.-to-the-foot scales are used. Often such layouts are made on vertical boards, and all except the lower areas must be reached by climbing ladders or standing on platforms. Yet, it is difficult, if not impossible, to visualize the layout of a department and its relation to adjacent departments without such boards.

At the Indianapolis Works, this problem has been solved by wrapping the layout of the entire plant around a pentagonal frame supported horizontally between pedestals. Six 27½x41¼-in. layout boards are clamped side by side on each face of this frame. The length of the plant is shown around the circumference of the frame, and the width is shown longitudinally along the frame faces. Only four boards on each face are required to show the layout for the present width of plant, leaving two additional boards available for plant expansion in width.

The pentagonal frame consists of five individual frames with each side formed to 54° included angle so the sides can be bolted together. This assembly then is bolted to 2½-in. thick pentagonal end plates. Each of the side panels and end plates is of welded construction, the various members being formed from 10-, 14-, and 16-gage sheet steel. Each of the side panels is 13 ft. 9 in. long and 40¾ in. wide over the corners.

Baseplate of each individual layout board is a 27½x41¼-in. plywood board beveled to an included angle of 54° along the 27½-in. edges (see corner detail). The corner of each board is notched to clear the Nos. 10-32 studs which project radially from the frame at points where board corners match. Clips formed from 16-gage stainless steel and knurled brass thumbnuts are fitted on these studs to hold the plywood boards in place.

Each plywood board is faced with ½-in. Vehosote composition board, which is soft enough to permit easy insertion of tacks or pins to hold layout templets in place. This composition board has been covered with smooth drawing board surface paper marked with draftsman's black ink to show columns and aisles. The surface paper is washable, so smudges easily are removed.

While individual boards can be removed to a desk when major layout changes are necessary, the pentagonal frame easily can be turned to bring any of the sides to convenient working height when minor changes are necessary.

# How to Deal with Contract Shops

**Owner Denison, speaking from the vendor's viewpoint, tells where to look for profit leaks. These practical suggestions will help many companies reduce the cost of purchased parts**

BY JOHN S. DENISON, Manager, EXCEL MACHINE SHOP

ALTHOUGH our specialized job shop is usually more efficient in its line than the larger general-purpose factories it supplies, top efficiency is possible only if the customer will deal realistically with certain aspects of job-shop operation that are widely overlooked.

We have two things for sale: price and reputation. Of the two, reputation is by far the more important. We get our jobs because the customer believes he will get good work and on the promised date. If we shut down just one customer with bad work or slow delivery, our name is mud in ten counties overnight.

On the other hand, although this reputation for quality is essential to our success, it may have an important effect on the price that we must charge. In the absence of definite specifications, we work to standards of quality that are high enough to protect our hard-earned reputation, and, of course, we charge the customer accordingly. If these implied standards happen to be unnecessarily high, they add needless cost to the job.

Hence, in dealing with contract shops, one of the first things to think about is specifications. Specs, as they usually appear on a blueprint, leave much to be desired. They always indicate what is required but seldom what is *not* required.

### PRINTS OMIT MUCH

Consider how a customer's print looks to us when we're trying to figure a price: There it is, a bunch of holes and surfaces. Exceptionally smooth surfaces may specify a micro-inch surface. Many dimensions are only size and location. We may have excellent reason to believe that certain dimensions and surfaces are completely unimportant as to finish or even size. But will the customer's inspectors think so? They get the same print we do, and know a good finish when they see one. Suppose the finish is unimportant on some surfaces. Will they dare stick their necks out?

Let's see Mr. Customer about it. Purchasing shrugs his shoulders and says, "There's the print; that's all we know. Let's ask engineering." So we run around to the dozen or so engineers who worked on the print and finally to the chief, who says:

"Look, Bud, you're right about those finishes, but what can I do about it? There's nothing I can put on the drawing that will show what is not required and there's 100 guys who will use this print. Should I go and tell all of them what's what?"

So we give up and bid on the usual good finish and close tolerances. The customer will get good work all right, but he is also throwing hard cash out the window.

Key man in eliminating such losses and in improving contract relations is a strong and competent purchasing agent. We are happy to talk concessions as long as he talks sense and his reasoning will stand the light of day. But we must have confidence that this man will go to bat for us when concessions are needed the other way. Leave the office boys and shoulder-shruggers at home.

### WATCH THESE OPERATIONS

Here are some practical ways to go about getting good work at lower cost.

**Holes:** More money is wasted on holes than on any other operation. We can avoid a lot of trouble if we know what the hole is for.

For instance, here is a reamed hole with a certain tolerance. We would normally take care to split this tolerance and provide a slick finish. But it costs money to keep on doing this, and, in spite of everything we will go over or under occasionally. Now, suppose we know a bushing will be pressed into this hole. Oversize would cause endless trouble, slight undersize would not, finish is unimportant. OK, then we work to the low side and ignore finish. Much cheaper.

Or, perhaps the hole is for a medium-speed shaft. Finish is important, undersize would hurt, oversize would not. OK, we stay on the high side.

Suppose the shaft of a control lever rides in this hole. Nothing is important except undersize.

In all of these cases, we can save the customer money, but he will have to work with us on it. The same goes for bored holes, only more so.

**Flat Surfaces:** A flat surface can be anything from a "seal surface" to something flat enough to hang legs on. All are designated the same way unless the draftsman notes how to produce them, such as "mill" or "grind." Even if it is perfectly obvious that a gasket surface is wanted, it makes a big difference whether the gasket is solid copper, cork, or other material. Also whether high pressures are involved. Smooth surfaces and those that we think must be perfectly square or parallel to each other are always expensive. But that's what the customer will get unless he says otherwise.

**Turned Surfaces:** Size is not hard to hold. Neither is smoothness. But holding both is costly. Nevertheless, that's what we'll do, if we lack specific instructions for the work.

**Locations:** Certain locations are exceedingly important; others make little difference in the functioning of the part; all are treated pretty much alike on most drawings. Yet a simple understanding (that we can depend on) may well make the difference between a $50 jig and $500 one. Locations, especially on flat surfaces in different planes, cost real money to hold.

**Clearance:** If an operation is for clearance purposes, for heaven's sake, say so! Many a dollar has been spent holding size and location on a cut that produces clearance for something that never comes within ¼ in. of the surface.

**Radii and Chamfers:** Most radii and chamfers are necessary, but the exact size is usually unimportant. The draftsman has to put something down so he calls for 1/16 or 3/32 or some other figure that is about right. These are expensive to hold exactly but we are duty bound to do it (and charge for it) unless told not to.

## AVOID THESE PITFALLS

In addition to specifications, there are several business practices that have an effect on cost.

**Appearance:** We are proud of our work. We want it to look nice and will make it that way if the customer fails to give other instructions.

**Samples:** Don't send us a sample and say, "Make us six of these." We'll make them, all right, but, brother, will they cost! How do we know that this surface is only clearance, that the radius is incidental, and that those hole locations don't have to be held to a tenth?

**Exact Quantities:** Nobody expects to be able to start 100 pieces through the mill and finish exactly 100. So we always start more and usually finish with a few more than necessary. What are we to do with these extra pieces? Hold them and hope for another order some day? No, sir! The customer who insists on only the exact amount will get just that number, but he might better take the extras because he's paying for them anyway. The price per piece has been figured to include the overrun.

**Stand-by Orders:** The big mail-order houses formerly used this system. They would approach a manufacturer and say, in effect:

"Now look, you have a nice shop, you make a good gadget that sells for 25¢. It buys your tools, pays your overhead, and nets you a nice profit. Your only trouble is the slack time between orders. If you'll sell to us for 15¢, we'll take as many as you want to sell us and whenever it pleases you to make them."

That is powerful talk, especially these days when layoffs and short work-weeks are out the window.

**Material Changes:** A fruitful source of savings is material. Often, a change in material makes no difference in the final use of the part but makes a tremendous difference in ease of machining.

**Time and Material:** Some jobs will be cheaper on a time-and-material basis, especially unusual jobs that no one can estimate exactly. We can give a firm price on anything but the figure will have to include a lot of contingencies that probably won't happen.

In this case, there are several ways to guard against gouging. Check the reputation of the supplier. Make sure he has the proper equipment and experience for the particular type of work. Ask to be called over when a certain amount of time has been spent.

**Quantities:** Quantity is all-important when bidding on a job. A customer must not get bids on 10,000 pieces, then come through with an initial order of 50 pieces and expect the same price. Likewise, if he has bids on 50 pieces and then finds he will need 10,000, we'll gladly reduce the price. But those things have to work both ways.

**Turkeys:** No one has had experience on every combination of operations and occasionally we will guess wrong and underbid a job. General practice is to stay with it for a substantial period of time, then ask for a raise and offer to give the job back for re-bids if desired.

If a customer is reasonable about occasional errors of judgment, two things will happen: (1) On future bids we will take more chances on unusual operations, rather than price-in every contingency; (2) We will be more likely to lower a price if we find that we bid unnecessarily high.

**Rebids:** Properly done, a good way to keep your suppliers on their toes is to put jobs out for rebids periodically. Good suppliers do not fear competition. Be careful how its handled, however. For instance, any company that pulls a job before tooling is paid for will be in the doghouse in six states.

## TALK IT OVER

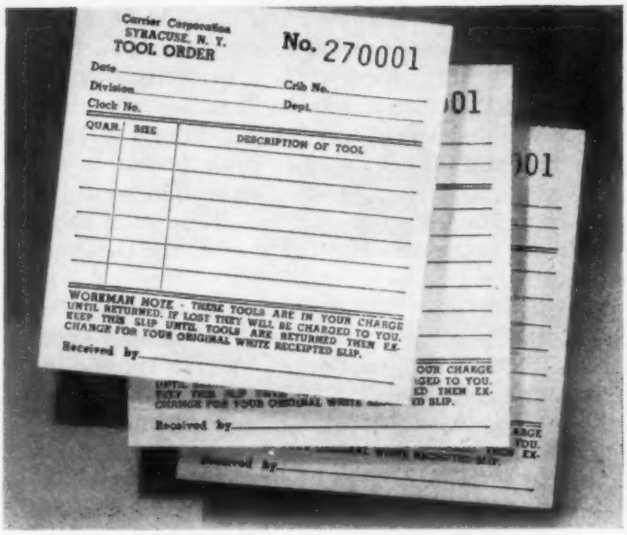
A good way to start when looking for these savings is to ask us what can be done after we have run the job a few months. By then, we usually know how our costs could be lowered.

These profit leaks are the hardest thing in the world to plug. Why? Because everyone is "right." Engineering used standard terms on the print; purchasing took the low bid; the contractor made it according to standard practice; the piece-part works perfectly. Everybody is "right," but the company is still throwing big money out the window.

**BOARD SHOWS WHO HAS . . .**

**1** **Tool board** holds orders describing the tools charged to each operator. Worker's clock number is on the tool check in spring clip. When tools are returned, order is removed by the crib attendant and destroyed

**TOOLS LISTED ON ORDER**


Carrier Corporation
SYRACUSE, N. Y.
TOOL ORDER
No. 270001
Date
Crib No.
Division
Dept.
Clock No.
QUAN.
SIZE
DESCRIPTION OF TOOL
WORKMAN NOTE - THESE TOOLS ARE IN YOUR CHARGE UNTIL RETURNED. IF LOST THEY WILL BE CHARGED TO YOU. KEEP THIS SLIP UNTIL TOOLS ARE RETURNED THEN EXCHANGE FOR YOUR ORIGINAL WHITE RECEIPTED SLIP.
Received by

**2** **Tool order** identifies tools and workman to whom issued. Original is filed on board in crib, first carbon is for bin from which tool is removed, and second carbon is given to workman for his record

# CONTROL YOUR TOOLS

***• Here is a system that fulfills logical objectives in the control of tools at every stage of the process from purchasing to salvage***

BY T. F. DUNDON
Supervisor of Tools and Supplies
CARRIER CORPORATION

HIT-OR-MISS tool control cannot be tolerated in the high-production machine shops of today. The great variety of perishable tools used in modern manufacture makes necessary a comprehensive system that serves production well and yet guards against loss from over-stocking. For a well-rounded program the system must also do several other things: (1) keep tools active, (2) enable economical repairs, (3) provide comparative performance records, (4) guide purchasing, (5) get supervision in on troublesome jobs, (6) aid quality control, (7) promote safety, and (8) salvage worn tools.

At Carrier, responsibility for control procedures rests with the supervisor of tools and supplies. The activities under his direction are a part of factory engineering, which includes such related departments as time study, methods, tool design, and plant maintenance. This setup permits a close association with these departments, both as to physical location and organizational relationship. It thus enables an easy exchange of information of value to any of the various units.

### *Tools Are Available*

In order that tools may be available at a moment's notice and replacements may be obtained according to usage, a master and sub-crib system is used throughout the plant. The master crib serves as a main source of supply for the six sub-cribs conveniently located one in each of the manufacturing divisions.

Each sub-crib specializes in handling tools and supplies normally needed for performing the work in that particular production group. There are also three extra cribs—one for special steel, one for jigs and fixtures, and a third for oil, lubricants, paints and cleaning material.

The master crib, in addition to issuing replacements to all tool cribs, serves the maintenance division and the press shop. This arrangement was made because the crib is well located for service to these two departments.

### *Responsibility Is Fixed*

In supplying tools to production operators, the system is set up to guard against loss by theft. Each time a tool is issued, responsibility is definitely fixed by writing a tool order that describes the item requested. The form is in triplicate

and is signed by the operator to acknowledge receipt of the tool.

The second carbon is retained by the worker; the original, and often the first carbon, is filed on the tool board behind spring clips. If the tool is valuable or likely to be out for some time, the first carbon is spring-clipped to the rack or bin that held the tool. When the tool is returned to the crib, all copies of the tool order are destroyed.

Drills, milling cutters, and other tools in need of sharpening are sent to the proper department. All cutter grinding is handled through the cribs.

### *Hoarding Is Prevented*

Every two months a check is made of tools outstanding and all tools must be accounted. For missing tools, a report is made out giving a full description of the tool, its price, and the operator responsible. This information is submitted to the division superintendent for whatever action he may consider necessary. At the same time, a copy of the tool order is filed against the employee's tool record in the sub-crib.

This periodic check is an important feature of the system and serves several other useful purposes. It is a means of reducing inventory costs by preventing hoarding. Tools that operators do not need must be turned in and, in this way, are kept in active circulation. This helps hold the investment in tools to the minimum required for efficient operation.

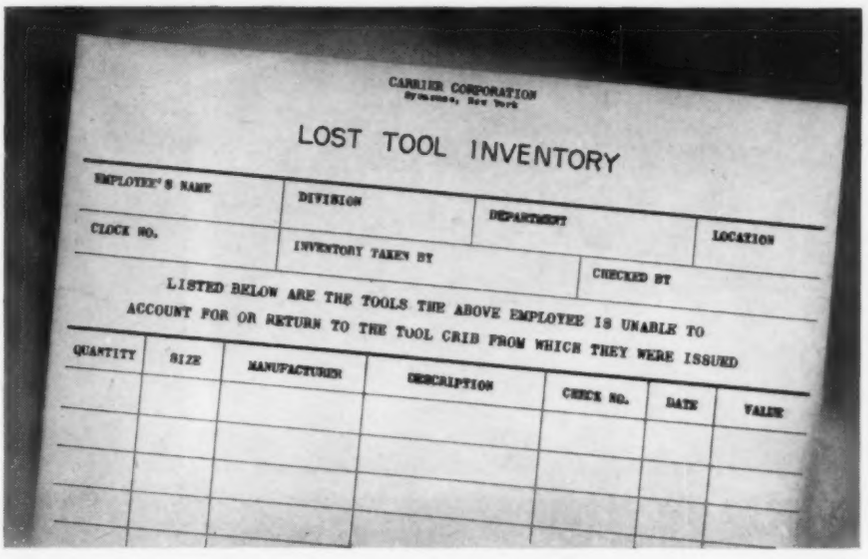
It also enables getting worn tools back to the crib before they have gone too far for economical repair. When the operator presents his tools, they are examined by a competent crib man who issues a replacement, if it seems advisable, and has the returned tool put back in A-1 shape. This practice not only saves money but also promotes safety and safeguards quality. Work-weakened tools are removed from manufacture before trouble occurs.

### *Supervisors See Damaged Tools*

If a tool is broken or damaged, the operator may obtain a new tool by returning the defective one to the crib and presenting a requisition authorizing the replacement. In this way the person who is responsible for signing the authorization has the opportunity to examine the broken tool to determine whether method, operator, or tool is at fault. At the same time, any operation that is troublesome and causing excessive breakage is brought to the attention of supervision.

So attendants will know whose signature to honor, the crib has a list of persons authorized to requisition tools and supplies.

## PERIODIC CHECK REVEALS WHAT TOOLS ARE LOST . . .



CARRIER CORPORATION
Syracuse, New York

LOST TOOL INVENTORY

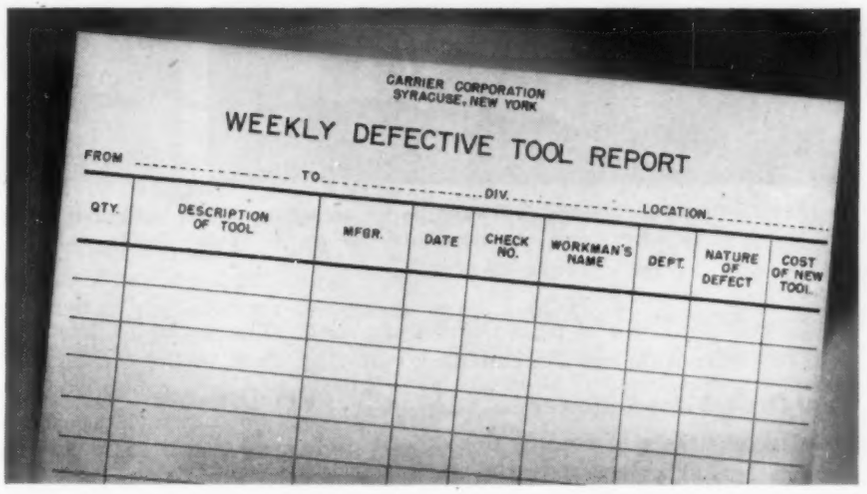
| EMPLOYEE'S NAME | DIVISION | DEPARTMENT | LOCATION |
|---|---|---|---|
| CLOCK NO. | INVENTORY TAKEN BY | CHECKED BY | |

LISTED BELOW ARE THE TOOLS THE ABOVE EMPLOYEE IS UNABLE TO ACCOUNT FOR OR RETURN TO THE TOOL CRIB FROM WHICH THEY WERE ISSUED

| QUANTITY | SIZE | MANUFACTURER | DESCRIPTION | CHECK NO. | DATE | VALUE |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**3** **Lost tool report** is made out for tools not located during a check made every two months. Original of tool order is attached and report is forwarded to division superintendent. First carbon of tool order is filed against operator's record in crib

## DEFECTIVE TOOLS ARE REPORTED WEEKLY . . .



CARRIER CORPORATION
SYRACUSE, NEW YORK

WEEKLY DEFECTIVE TOOL REPORT

FROM ..... TO ..... DIV. ..... LOCATION .....

| QTY. | DESCRIPTION OF TOOL | MFGR. | DATE | CHECK NO. | WORKMAN'S NAME | DEPT. | NATURE OF DEFECT | COST OF NEW TOOL |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**4** **Defective tool report** is compiled in the crib and priced. A typewritten copy is sent to the division superintendent each week

At the crib, a full description of the tool, price, defect, and the operator's clock number is entered on a defective tool report. This record, showing the performance of the tool, is sent to the division superintendent once a week.

### *Tools Are Replaced*

The damaged tool is sent to the master crib with a material requisition for a replacement. These "reqs" are usually filled within 24 hours. The form then travels to accounting where the original is

## RACKS SPEED SERVICE AND SIMPLIFY STOCK CONTROL . . .

5 **Master crib** supplies six sub-cribs, one in each manufacturing division, and serves the maintenance division and the press shop. Racks simplify inventory taking and stock control

held. The duplicate is priced and sent to the division superintendent.

### *Tool Orders Are Followed*

As requisitions are being filled in the master crib, quantities in stock are noted. When an item gets low, the tool crib foreman forwards a purchase requisition in duplicate to the supervisor of tools and supplies for his inspection and approval. If purchase is approved, the duplicate is held in his office. The original goes to the purchasing department, which sends to the record division of tools and supplies a copy of the purchase order entered on the vendor. Tools and supplies thus has a record of the placement of the order and the promised date of delivery. A daily check of all orders can thus be made for follow-up purposes.

When the material is received, the order copy and receiving notice are filed. The tools go from the receiving dock to the master crib.

Although it is a prime requisite of any system that tools are available when needed, this in itself is not enough. The system must also save operating dollars by establishing economical tool standardization. Key to safeguarding standardization is adequate control in the ordering of new tools.

### *Avoids Excessive Stocking*

Requests for items not carried in stock may come from the shop foreman or tool design or methods. The foreman originates a plant requisition, countersigned by the division superintendent, and forwards it to the supervisor of tools and supplies. If the request comes from tool design or methods, for new or revised manufacturing operations, the desired tools usually appear on an operation sheet.

The sheet is checked and if an item is carried in stock, the supply of these in the master crib may be increased. If no Carrier standard tool is satisfactory, the new tools are authorized for purchase and the procedure is similar to that for ordering replacements for stock items. The number of new tools ordered is relatively small, because, wherever possible, tools already adopted as standard are specified.

As a result of this standardization and control, excess stock on 26 special war contracts requiring $200,000 worth of tools and supplies hardly exceeded $500. Between 8000 and 9000 separate items were carried.

### *Records Tool Performance*

Another important part of the tool control system is the compiling of information that is useful as

a guide to intelligent purchasing. Data on the comparative performance of different kinds and makes of tools are recorded in the cribs. This information forms the basis for a rated listing of "Approved Manufacturers." Included are comments on the performance of the various tools.

To keep well advised and to be in a position to take advantage of improvements in tools and supplies, tests are run on tools in production. Results are recorded on a simple form on which is noted the tool on test, its comparative cost, and the value of the present supply on hand. This prevents promiscuous buying based on claimed improvements. At the same time, it gives a true picture of actual performance under the production conditions in the shop.

These findings are not confined to company personnel only, but often are shown to manufacturer's representatives. Such action creates good will and gives the representative a chance to offer constructive criticism.

The tool control system also acts as a check on some of the safety measures practiced in the plant. From the records it can be determined whether or not a worker has withdrawn such safety supplies or goggles. In addition, the periodic check contributes by removing weak or faulty tools from production.

### Salvage Is Broad

The master crib runs a central salvage station. Here, all manner of tools and supplies are reconditioned for further use—cemented carbide tipped tools, wrenches, reamers, hand and rotary files, paint guns, electrode holders, spark plugs, leather sleeves, aprons, and other products.

Worn sanding disks are cut down to smaller diameters. Old grinding wheels are sold to a nearby cutlery plant for use in tumbling. High speed tools, broken or otherwise unsalvageable, have been sold to a local steel company.

One interesting feature of the salvage work is that about 500 pairs of gloves are cleaned and remated monthly.

## CONTROL MEANS LESS LOSS ON INVENTORY . . .

6 **Excess tools** after doing $37,000,000 worth of production work during the war period were piled on one table. Value was approximately $600

### Attendants Keep a Log

Each attendant keeps a log which presents a picture of crib operations and its problems, and serves as a basis for improvements and remedies. In it is entered such information as the hours worked, complaints received, troubles encountered, requests for special tools, issuance or ordering of wrong tools and the circumstances, and other pertinent particulars. In the front of the log book are listed the duties of a crib attendant.

Catalogs and manufacturer's literature on machines, tools and supplies, are kept by each attendant. This is a part of the educational program conducted to familiarize the attendants with the tools they are issuing. Another part is permitting manufacturers' representatives to assist certain machine operators. This practice is especially advantageous when machine or tool trouble develops.

In selecting attendants, the crib is not considered a spot for semi-retired workers, or an easy berth for men who have slowed down. Whether the attendant is young or old, he or she must possess: alertness, a knack for details, a friendly personality, a vein of humor, and a highly developed sense of responsibility.

This policy stems from recognition of the fact that the crib is an important factor in a production department. If the crib is unattended at any time, expensive equipment and skilled labor may be held up waiting for tools. The same thing occurs to a lesser degree if the crib is undermanned or staffed by irresponsible or incompetent men. Selection, therefore, deserves close and careful attention of supervision.

### Coveralls Are Laundered

A special service of the sub-cribs is handling the issuance and laundering of coveralls. Workers are supplied coveralls on tool checks and are charged only for laundry.

Formerly, when operators took care of their own laundering, work-clothes services complained of losses because some workers did their own laundering and others never returned the clothes when they left the company's employ.

It is evident that an effective system is a sound investment and a vitally important part of manufacturing. It not only helps to control inventory but also holds repair costs to a minimum, keeps tools active, guides wise purchasing, and acts as a medium for quality control. It gives real meaning to the principle, "Order what you need—but be sure you need what you order."

# TALKING SHOP

### Springs in Color

COLOR identifies work at final inspection in the Hunter Spring Company. Small sorting pans are enameled in green for good springs, red for weak ones, and blue for strong ones. Large tote pans are similarly identified by a 3 x 4-in. metal tag of correct hue. Mix-ups are thus avoided.

Hunter became color-conscious in helping a customer lick the problem posed by variation in the weight of a spring-actuated part. Springs were separated into three categories according to strength, and dyed green, red or blue. Similarly, parts were classified into three groups, according to weight, and painted. In production, parts of one color were assembled with springs of the same color. Automatically, this matched heavy parts with strong springs and so on. Defects in assembly dropped from 41% to less than 1%.

### Motto

AT W. H. NICHOLS CO., Waltham, Mass., where tolerances range from 0.000025 to 0.0001 in., is this motto: "Anything Almost Right Is Wrong."

### Convertible Converted

STEAM-BENT wooden crossbows and forgings that characterized the prewar convertible top yield to hat sections, die castings and precision-machined parts in the new Hudson convertible. As a result, the top is a precision fit that fits windshield framing when up and the back pocket when down—and without vigorous assistance from driver and passengers. Hat-section crossbows are inverted and the channel filled with felt strips that support the fabric faultlessly without scuffing it.

### Gang Machining

CASTINGS made in special gates of two—four or more pieces at a time—are no longer being cut apart at automotive foundries. Sprues and risers are cut off and the rest goes to the machine shop. Thus, an operator may handle as many as eight pieces instead of one at each loading, drill and ream 16 holes instead of two at a clip. Final operation is to cut pieces apart.

With carbide tools, machining time may be only a fraction of cycle time. handling the ganged castings saves costly minutes of loading and unloading time before final machining operations.

### Daffynitions

GOOD BOSS: one who has trained subordinates to shoulder all his responsibilities. GOSSIP: anything that goes in one ear and over the back fence. PROGRESS: state of human development in which a man pays a laundry for destroying his shirts. LITTLE WOMAN: a dangerous thing. ALIMONY: high cost of leaving. COUNTRY COTTAGE: three rooms and a path. HIGHBALL: milk of amnesia. CONSCIENCE: what hurts when everything else feels so good.

### Upsetting Trick

PNEUMATIC UPSETTERS with built-in resistance heaters are used to produce thicker diameters on valve stems at Chapman Valve. Some upsets are made on the extreme ends of shafts—and without the expected tit resulting from the non-plastic metal cooled by the contact electrode. The trick is to heat the proper area, to back off the end electrode for just long enough to equalize the heat, then to come in and "bump" the end of the piece for the upset. This procedure gives no time for recooling.

### Cleaner's Bill

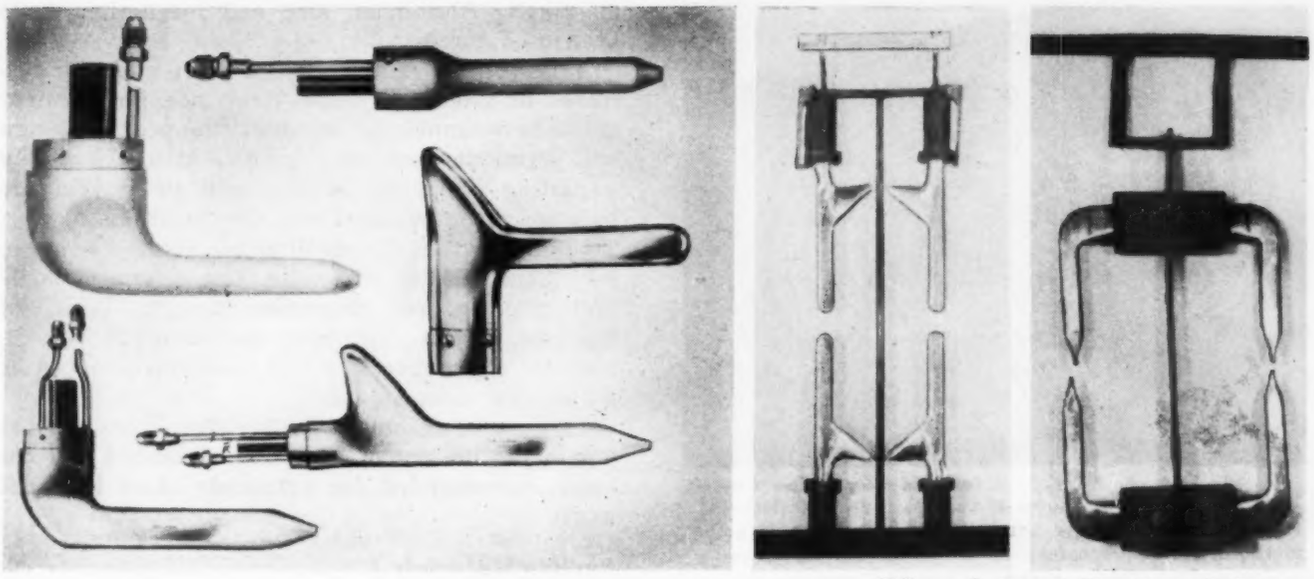
RECENTLY, a large Eastern plant converted its 25-year-old steel foundry into a heat-treating department. In preparation, the ceiling and walls were vacuum-cleaned (section by section, by dividing the building into "rooms" with tarpaulins) and the windows were washed. The bill for cleaning was $40,000; for window-washing $10,000. Who said costs are up?

### Materials

THERE IS NO LONGER any monotony in materials available for a given job, with new plastics announced almost every week. High-voltage electric cable is now being protected for shipment by a plastic sealing compound . . . Plexiglas II is able to withstand 140 F., 36 F. higher than its predecessor. It also has 9,000-psi. tensile, up 1,000-psi. Production operations are the same, except that ovens for heating before forming must be 36 F. hotter . . . Latest among fire-retardant paints is a phosphate resin aqueous emulsion, which puffs up to form a heavy sponge-like insulating mat when exposed to flame. This mat excludes oxygen, prevents burning below it.

### Water Starts Fire

USUAL METHOD for detecting leaks in high-pressure, high-temperature steam lines is to put a rag on a stick, then pass the rag alone the line until it bursts into flame. High-pressure steam is of course invisible, doesn't become the familiar visible vapor until it's some distance from the line. Thus, in this case, water starts the fire.



*Kollsman Instrument Div., Square D Company*

**Intricately shaped parts** can be produced to close tolerances and excellent surface finish by means of electroforming. Bodies for pitot-tube assemblies (left) are made by plating onto matrices or mandrels arranged on the racks (right)

# ELECTROFORMED PARTS MAY BE YOUR ANSWER

**By plating onto a mandrel or matrix, and stripping the shell, parts can be obtained that are difficult or costly to make by other methods**

MODERN electroforming techniques make it possible to produce sleeve journals for watch-second hands, fountain pen caps, a 5-ft. reflector for Army searchlights, plus radar and electronic parts. Or the process can be used to make screens, facings for molds to produce toys and novelty jewelry, embossing plates for artificial leather.

In other words, by plating onto a pattern of any predetermined shape or size, one can produce a thick or thin shell that duplicates the master within close tolerances. Thus, by electroforming one can get parts that may be costly, difficult or impossible to make by casting, forging, machining or powder metallurgy.

But a word of caution should be introduced. In some instances, electroforming is being done successfully by companies without special skills in the field. On the whole, however, the practice of the art is restricted to a relatively few concerns.

The purpose of this article is to show the steps involved in electroforming and to cite what is being done with various plating metals. For those who see an opportunity to use electroformed parts, it is suggested that consultation with a qualified specialist be undertaken before the design is finally approved. Many times a small change in the design, immaterial to the finished product, will mean the difference between success and failure in electroforming the part.

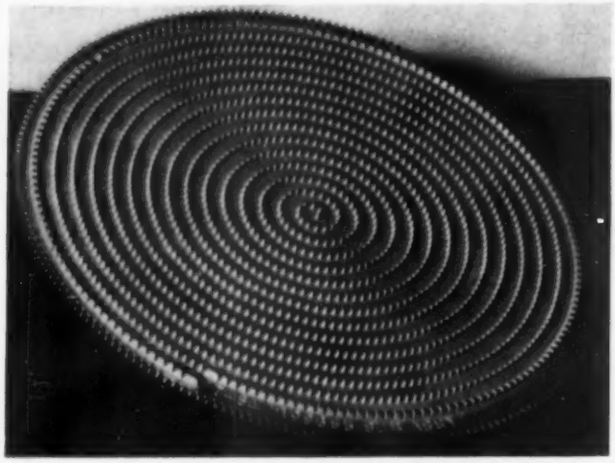
### *What Electroforming Involves*

Steps in the electroforming process are:

1. A matrix is made from a master pattern of the part.
2. The matrix is treated to assure successful deposition and subsequent stripping of the deposit.
3. The matrix is placed in an electroplating bath and suitably mounted.
4. Electro-deposition proceeds until required metal thickness has been obtained.
5. The unit is removed from the bath and the electroformed part is separated from the matrix.

### *How Matrix Is Made*

Since the matrix determines the shape, dimensional accuracy and surface finish of the formed part, its importance cannot be over-emphasized. Many materials are used. The choice depends upon



*Cerro de Pasco Copper Company*

**Extreme example** is shown of the usefulness of electroforming in producing a part difficult to make by other methods. This electroformed precision cam was created by plating onto a matrix made of Cerrobase non-shrinking, low-temperature-melting alloy

type of part being electroformed and quantity, as well as on the materials available. Wood, rubber, plastics, plaster of Paris, fusible alloys, aluminum, zinc, chromium-plated steel, glass and brass have been used for specific purposes.

Matrix materials may be classified as: (1) permanent—steel, brass, nickel, stainless steel; and (2) expendable—subdivided into zinc and aluminum, and fusible materials such as lead alloys and waxes. Regardless of the material used for the matrix, rounded contours are desirable; sharp deep recesses should be avoided; slight tapers are advantageous where permanent cores have to be withdrawn.

Matrices can be formed in several ways, depending upon material, quantity, tolerances, shapes desired and availability of equipment. Common methods are: die, slush and permanent molding; casting, hubbing and machining.

The machining and hubbing methods are used for both expendable and permanent matrices, and are the most economical processes for low quantities.

For novelty work where tolerances of ± 0.010 in. are involved, matrices are made of low-melting substances like lead alloys and waxes. But such materials are often unsuitable when tolerances are in the order of ± 0.002 in. Surface finish may be difficult to maintain. Exceptions may be noted: Modern developments with Cerrobend and Cerrobase alloys have resulted in high-quality duplication of surface finish. Cerro-Tru, a tin-bismuth-lead alloy has proved excellent for fine surface duplication.

The soluble type of expendable metallic matrix is used on designs where permanent mandrels cannot be employed, either because of shape or complexity of the part; or when desired tolerances and finish cannot be achieved with low-temperature melting materials. The matrix material can be any metal which will not anchor to the electrodeposit, and which can be readily dissolved by an acid or an alkali. Aluminum, zinc and magnesium have been used successfully.

A permanent matrix, like a steel mandrel machined or ground to shape, dimensions and desired finish, is recommended wherever the product design will permit its removal after deposition. Generally a parting compound is employed to prevent the locking of the mandrel and the deposited coating. To allow for this, the mandrel is machined between 0.0002 and 0.001 in. undersize. One or several mandrels may be used, depending upon the design of the part. When more than one mandrel is used, they are interlocked in a way such that each can be withdrawn independently.

The use of chromium-plated steel mandrels has eliminated the use of a parting compound and has been recommended for extremely close tolerance work.

### Parting Materials

With exception of chromium-plated matrices, the metal matrices must be prepared to avoid adherence of the electro-deposited coating. Yet the surface must remain conductive. One method is to form an oxide or other metal compound on the surface of the matrix.

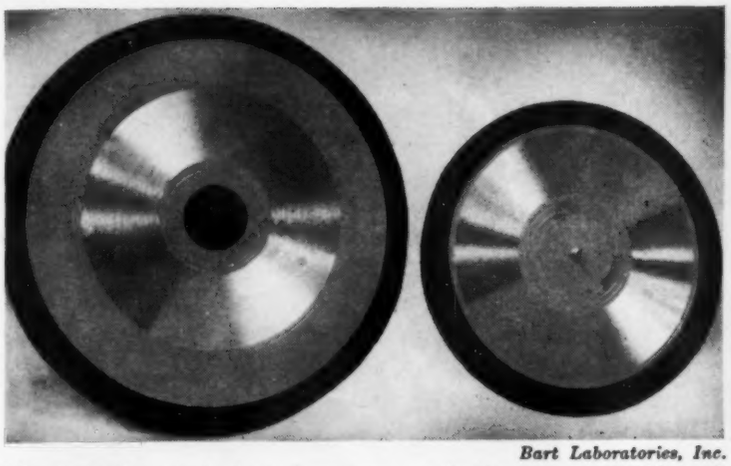
Parting compounds that are used to form a conductive film are: for rough work—graphite, either dry or in water suspension; carbon black, beeswax, collodion, turpentine; for fine work—potassium dichromate and solutions of selenium or arsenic salts.

### Preparation of Matrices

The use of non-metallic matrices involves two preparatory steps to render the surface suitable for deposition. First, the surface must be treated with varnishes, lacquers or waxes to make it impervious

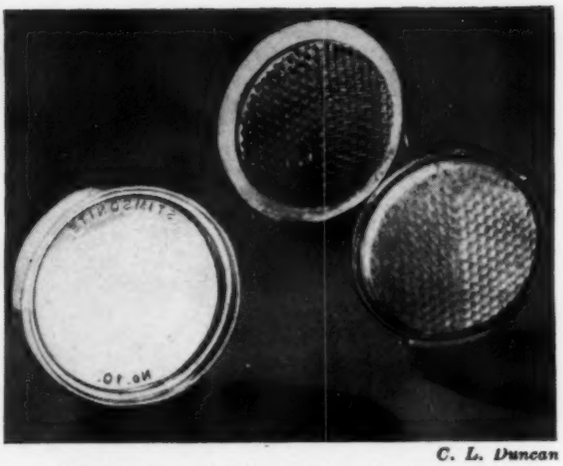
*Camin Laboratories, Inc.*

**Fountain-pen caps** are produced at the rate of 40,000 per week on a conveyorized plating setup. Caps are electroformed of nickel



*Bart Laboratories, Inc.*

**Phonograph records** have long been made through application of the electroforming process. At left, the reverse impression, or "mother"; at right, the "stamper" used for making pressings



*C. L. Duncan*

**Reflector lens shells,** front and rear, are produced by electroforming nickel on plastic patterns, and at low cost

to plating solutions. Second, the treated surface must be rendered conductive by brushing on graphite or by chemical reduction of silver on the surface. Cathode sputtering and vacuum vaporization have been used on a limited scale. Silver spraying has also proved adaptable for production-line electroforming.

### Mounting the Matrix

The manner in which the matrix (especially a non-conducting one) is suspended in the plating bath is of extreme importance to successful electroforming. Ingenuity may be required to assure uniform metal distribution—use of special anodes to secure sufficient deposition in recessed areas, or use of guard wires to prevent undue build-up on edges or projections. As a general rule, consideration should be given to the making of as many contact points as possible.

### Plating on the Matrix

Matrices rendered conductive with graphite are usually plated with a thin layer of copper, deposited from an acid solution. Low currents are used while the deposit spreads over the surface. Once the mold is completely covered, the deposition rate may be stepped up to normal. Articles covered with a thin layer of silver by chemical reduction can be plated in the normal acid copper solution, starting at low current density. Since silvered surfaces are excellent conductors, complete coverage with copper is achieved rapidly.

Articles rendered conductive with graphite may be nickel plated directly, although silver reduction instead of graphite is generally recommended for articles which are to be nickel plated. Silver deposits may be grown from a standard silver cyanide bath after silver has been reduced on the surface.

### Stripping the Work

There is no one best method for removing a deposit from the matrix. The low-melting matrices involve heating to temperatures between 200 and 600 F., usually in hot oil. To remove bits of the matrix which may remain on the part, mechanical brushing or electrolytic stripping may be employed.

Parting compounds used on steel mandrels may be metals that melt at low temperatures such as tin or cadmium; or various films of wax or lacquer. To separate the mandrel from the electroformed part, heat is used to melt the parting compound or metal. Pressure is then applied and the mandrel is forced away from the shell.

Another method involves choosing a mandrel of Kovar (a low-expansion alloy) or glass. When the unit is heated the electroformed shell expands and the parts separate. As previously stated, chromium-plated mandrels may be used without parting compounds.

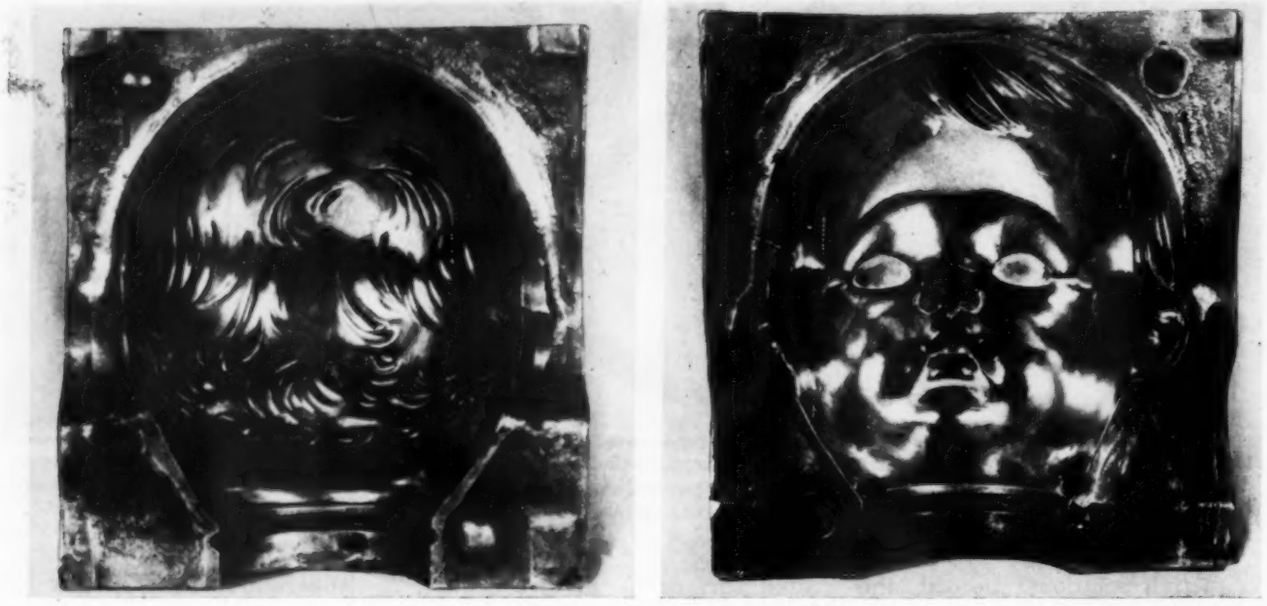
When the matrix has been formed from aluminum, zinc or magnesium—the so-called soluble matrix materials—the electroformed unit is placed in a suitable acid of alkaline solution and the matrix is dissolved.

### Materials Electroformed

Theoretically, all metals which can be electrodeposited can be electroformed, but the metals which have been electroformed commercially on a wide scale are iron, copper and nickel. Chromium has been electroformed commercially where extreme hardness and abrasion resistance are required, but applications are not adaptable at the present time to mass production. Silver is electroformed for ornamental purposes.

In a number of instances, parts have been built up by electroforming several laminations of different metals and a number of plated coatings have been used in connection with electroformed parts to secure specific qualities. Careful treatment of each layer is required to prevent separation of layers.

Internal stresses in electroformed sections are lower than those present in welded, forged or cast sections. In addition the physical properties of elec-



*C. L. Duncan*

**Molds** are frequently electroformed, particularly for toys and novelties. Shown are front and rear halves of a doll-head mold. Each mold facing is a shell of electroformed nickel and it is backed up with Kirksite, which is a lead alloy

troformed materials exceed in many cases the properties for the same metals in the cast, rolled or formed state.

### Electroforming with Iron

Electroformed iron represents a comparatively new engineering material. It is composed of 99.8% pure iron.

Average hardness is approximately 250 Brinell; tensile strength ranges between 50,000 and 55,000 psi. Tests have shown that electroformed iron is less porous than glass. It resembles low carbon steel in weldability and heat-treating characteristics, and it machinability resembles that of brass. It can be carburized to a depth of 0.100 in. and heat-treated to produce any desired hardness from 16-62 Rockwell C. Electroforming with iron is usually carried out in the ferrous chloride-calcium chloride bath at an average rate of 0.001 to 0.002 in. per hour. During the last decade, iron electroforming has become a practical production process.

### Copper

Copper is deposited from a sulphate bath. Its tensile strength ranges from 20,000 to 50,000 psi. Practical deposition rate with special equipment averages from 0.002 to 0.003 in. per hour. The softness of copper, 40-150 Brinell, somewhat limits its field of application. Electrotyping and the production of phonograph-record masters and stampers represent two major uses of copper electroforming.

Electroforming of reflectors was put on a practical production basis by B. Bart shortly after the first World War. A number of the developments enabled a large mirror, 5 ft. in diameter, to be successfully electroformed of copper and to have integral with it, a preformed mounting and supporting ring. This mirror was adopted by the U. S. Army Engineers and became the standard for the allies in World War II.

These mirrors were made by electroforming metal molds against accurately ground glass blanks. The glass was silvered and a preformed supporting ring attached. The entire assembly was then immersed in a normal acid copper plating bath for a period of six to eight days. The glass and metal mold were then removed and separated. The metal mold was then used in the production of searchlight reflectors by flashing the mold with nickel and attaching a preformed ring and building up on the surface of this metal mold and ring, integral with the ring, the electroformed copper-nickel body of the reflector. When the reflector had been built up, it was removed from the bath, separated from the metal mold and flashed with rhodium to give it high reflectivity and tarnish resistance.

The same principle is being used today on many types of electroformed reflectors made by Bart Laboratories, Inc.

And the principle was also used during the war in the production of extremely accurate radar wave guides, held to 0.0001 in. tolerance. It was possible with this method to electroform a laminated tube or section with the internally gold or silver plating, integral with the external copper or nickel structure.

### Electroforming of Spray Masks

Tremendous strides have been made in production methods for masking molded plastic parts for paint-spray operations. Many articles in daily use, such as automobile clock faces, automobile radiator emblems, or buttons, doll heads and refrigerator

handles, are being spray painted on a production basis.

Electroformed spray masks are used as stencils for shielding the portions which are not to be sprayed. By using some of the molded pieces as a base, an electroformed spray mask can be built up. By mechanically cutting out the letters, or figures, a perfect-fitting spray mask, which will not allow any over-spray, can be made.

### Nickel

Nickel electroforming offers a much wider range of predetermined physical properties in the as-plated condition than does either copper or iron. Through the use of the basic types of nickel baths, metal can be deposited with tensile strength ranging from 50,000 to 150,000 psi.

The ordinary low pH (2.0-2.5) Watts Bath operated at 140 F. produces a deposit of 50,000 psi. tensile strength with the Brinell hardness of 150. Elongation is 30% in 2 in. Practical deposition rate is 0.001 to 0.002 in. per hour.

The nickel-chloride, boric-acid bath operated at pH of 2.0-3.0 within a temperature range of 130-150 F. gives deposits ranging from 100,000-120,000 psi. tensile strength, with a corresponding Brinell hardness of 260-280 and an elongation of 12-20%. This bath has been found to be well adapted to general usage, since it combines ability to produce excellent physical properties with a high rate of deposition, minimum of treeing and roughness and ease of control.

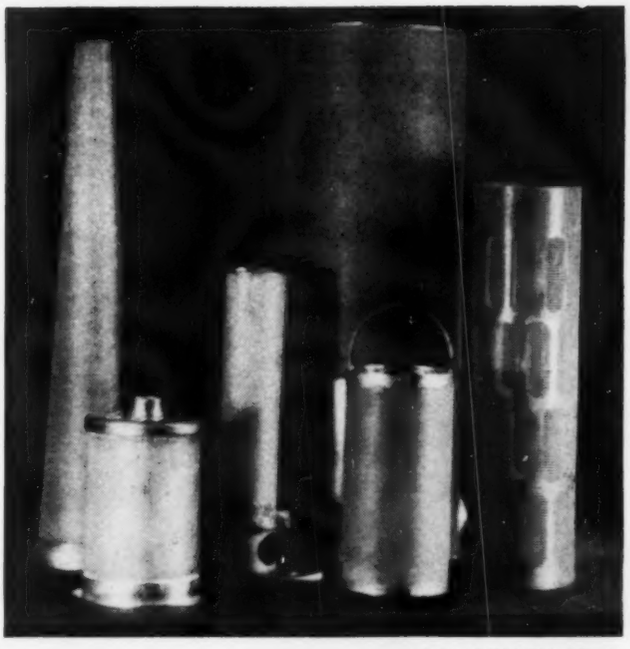
The double-salt hard bath used for the tensile range form 120,000-50,000 psi. is limited to applications requiring hardnesses between 28 and 45 Rockwell C. By varying the temperature from 120-140 F., the pH from 5.2-5.9 and the current density from 20-50 amp. per sq. ft., metal of any intermediate hardness and corersponding tensile strength can be deposited.

### Fountain Pen Caps

Recent developments by the Camin Laboratories, Inc. of New York City, have led to high-production electroforming of nickel articles. Ground steel mandrels have been used to manufacture fountain pen caps at the rate of 40,000 finished pieces per week. Plating rates of 0.010 in. per hour are being achieved on a production basis, and close tolerances are being held.

Camin uses a Watts bath at 150 F. with modified operating technics and current densities between 200 and 250 amp. per sq. ft. The process involves fixing the mandrels on an endless moving conveyor which spins and plunges them as it moves through the bath.

For general production work, Camin plates onto a hardened alloy-steel mandrel to which a thin layer of parting medium has been applied. After completion of the plating operation, friction is applied to the spinning mandrel to free the plated part from the shell. Tin-coated mandrels are removed by dipping the unit in a hot oil bath. To remove fusible mandrels made of bismuth-lead alloy, a 600 F. bath of Socony-Vacuum Hecla mineral oil has been found satisfactory.



*C. O. Jelliff Mfg. Corp.*

**Copper and nickel metal screen,** as made by electroforming, has closely controlled hole size and will not unravel during fabrication of articles like these

With permanent mandrels internal tolerances of ±0.0005 in. are achieved. Outside tolerances and thicknesses are controlled within ±0.001 in. With the fusible mandrels, Camin maintains tolerances on the order of ±0.002 in. Closer tolerances can be held but they involve excessive time and expenditure.

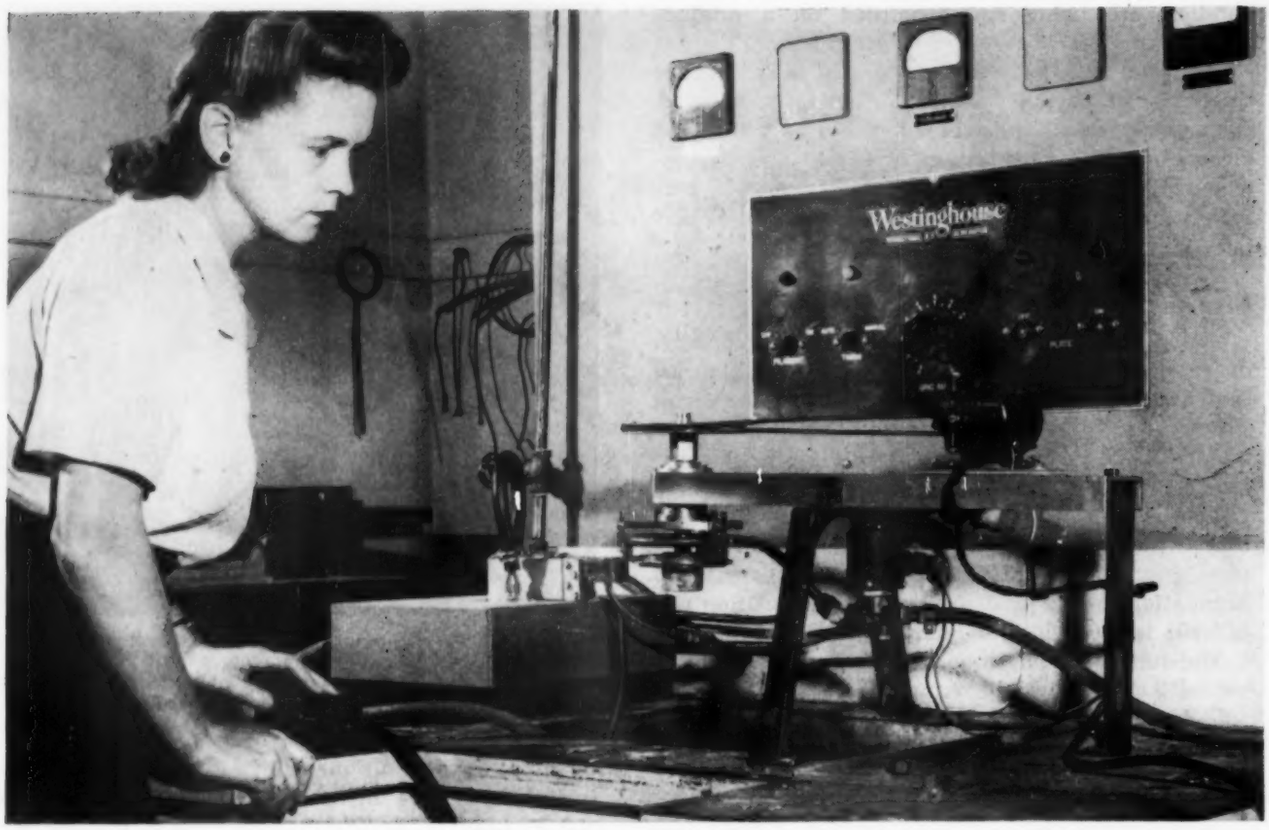
### Electronic Parts

For use where extreme accuracy is required, C. L. Duncan of White Plains, N. Y. has developed methods of electroforming electronic instrument parts to tolerances of ±0.002 in. Mirror finishes are possible on internal surfaces, and there is no limitation of design. Compound curves and angles in various planes are no obstacle.

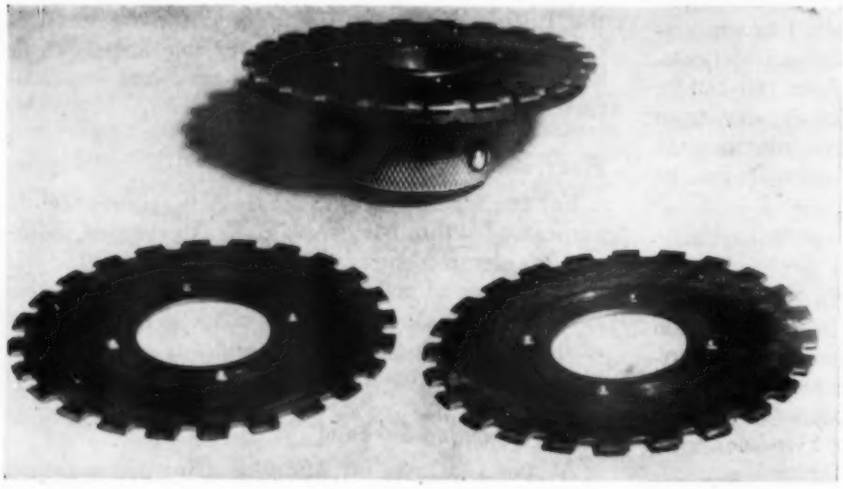
### Electroforming Screen

At the C. O. Jelliff Manufacturing Corporation, solid copper and nickel metal screening are electroformed by the patented Lectromesh process. Tolerance of ±4% can be maintained on a standard hole size. Since the screen is solid, it will not unravel and it is free from the danger of concentration-cell corrosion formed by moisture entrapped where woven screen wires cross.

Lectromesh nickel and copper electroformed screens are manufactured in mesh sizes ranging from 25-400 openings per linear inch. They are produced on a cylindrical matrix from a hand-drawn original by a process analogous to photoengraving.




**Air Quench Cuts Labor**—Rotating indexing plate (below) in a single-turn coil heats the tooth tips in 2 sec. The plate is then quenched by compressed air jets from the multi-hole manifold directly above it. Outer surfaces attain full hardness, and water sprays, splash shields, and part drying are unnecessary



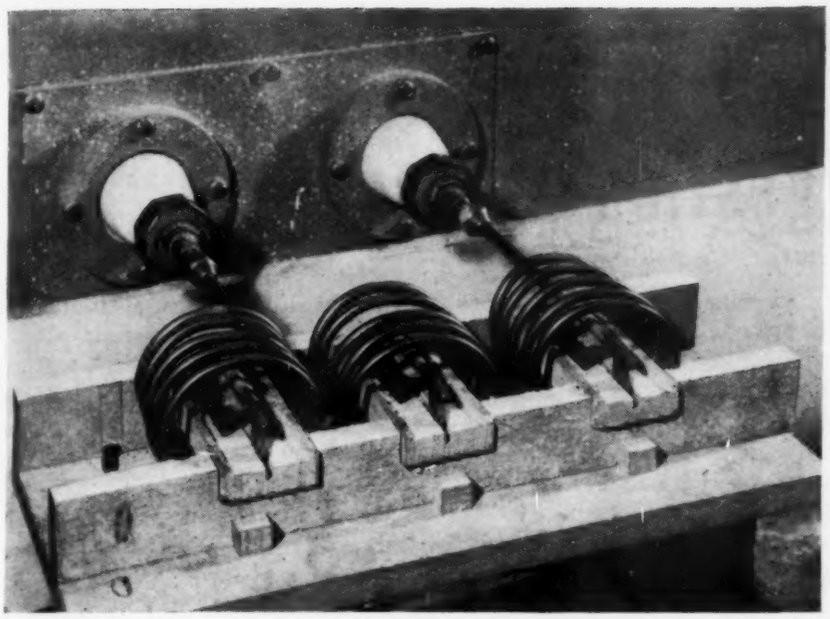
**Flatness Mandatory**—Indexing plates (1/16 x 4¼ in., of SAE 1095) for drafting machines must have outer corners of each tooth hardened, but the plate must not be distorted. Induction hardening achieves this (note oxide colors on hardened teeth at left, while roots show no color). Previous peripheral hardening cupped the plate (into an impractical straightening job); present untempered centers can be straightened readily if necessary. The copper fixture (top center) centers the plate on a bushing and provides support

# INDUCTION SPEEDS PRODUCTION

**Vard, Inc., of Pasadena, Calif., installed a 20-kw. Westinghouse 450-kc. radio-frequency generator.**

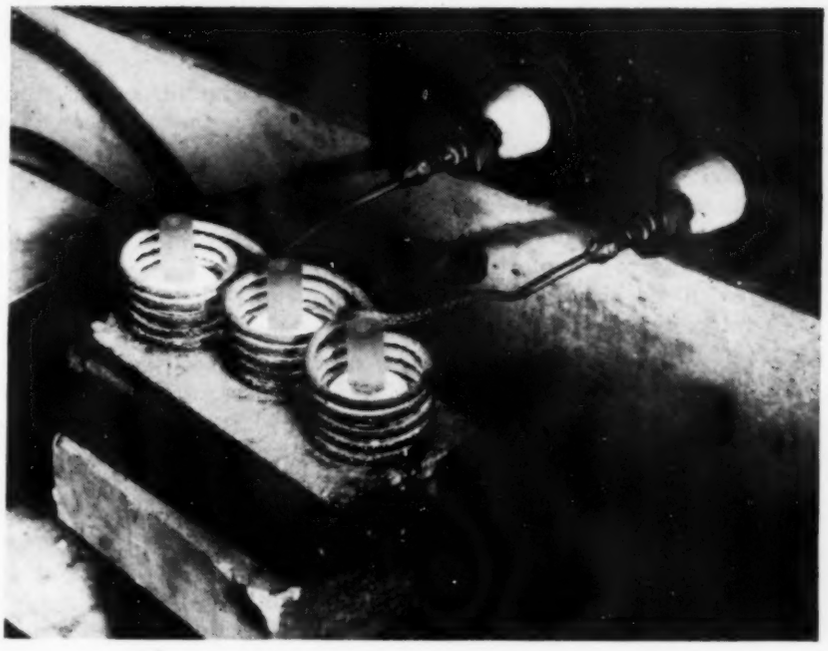
**Here are three typical jobs it handles, in brazing and hardening**

BY DR. R. A. NIELSEN, ENGINEERING & SERVICE DIVISION, WESTINGHOUSE ELECTRIC CORP., LOS ANGELES



**Triplex Assembly**—Three cam levers (top right) are brazed simultaneously in 4½ sec. in this fixture. Assemblies with a U-loop of brazing wire are set in Masonite forms within the three helixes in series

**Brazing A Hardened Part**—Drafting-machine cam levers are brazed assemblies of two parts, the lever and a semi-cylindrical shape. The lever is hardened before brazing, and with induction heating it has been found possible to complete the braze without annealing the vital area around the lever hole



**Gang Setup**—A series coil makes it possible to handle three gear assemblies (below) at once. No fixture is required beyond a Masonite plate which supports the coils and centers the gear blank

**Dissimilar Materials**—A brass gear blank and steel shaft are assembled with a ring of silver solder to make the wormwheel at left. The operation requires one minute, three gears being brazed at once

# How to Build a Workable Suggestion System

**Americans aren't the only ones who have suggestion problems. These comments on a Round Table subject show that it is possible to establish a system that works to everyone's advantage**

BY ADOLPH HAASS
VIENNA, AUSTRIA

A PRACTICAL suggestion system must meet the objectives of both management and the worker, but the worker's point of view should be considered most carefully. By nature and by education, the worker is often distrustful of proposals from management, and he is definitely the weaker partner of a suggestion team.

To overcome this distrust, management must realize that the worker fears many things:
. . . that he will receive nothing for his trouble,
. . . that others may steal the credit and benefits of his suggestions,
. . . that he will lose any advantage his special knowledge or ideas may hold for him,
. . . that he will not be taken seriously.

These fears are real and must be overcome by reassurance to the worker that he will be treated fairly. The worker must be made to know and trust:
. . . who will judge his ideas technically,
. . . who will judge his ideas economically and decide his reward,
. . . that no personal feelings will influence the judgment,
. . . that no foreman or supervisor will claim his ideas,
. . . that no one will hold it against him if he shows up wrongs in the shop that should have been righted by a foreman or supervisor.

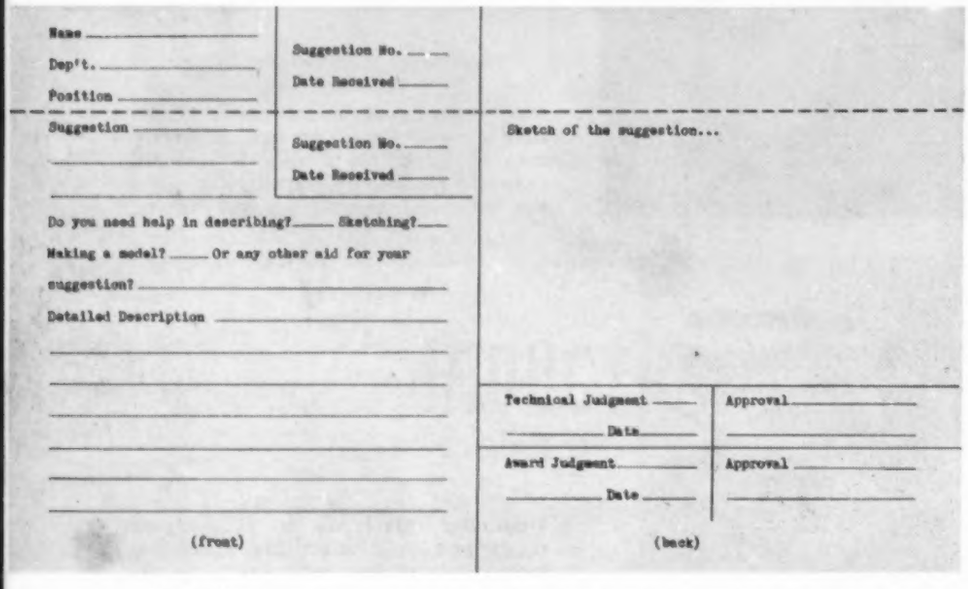
The problem of proving to workers that a suggestion system is not just another way to get more out of them with no reward is especially interesting to me because of the time and effort I have spent in establishing such a system in a wireless-set manufacturing plant. One important factor—secrecy as far as possible—was provided by suggestion boxes in many locations. Easy accessibility is important.

An employee who is trusted by the workers as well as management collects the suggestions at regular intervals, and he delivers them to a plant executive who numbers the forms and files the top section. After this routine, the suggestion is known only by a number, and employees are sure they will receive fair and uniform treatment.

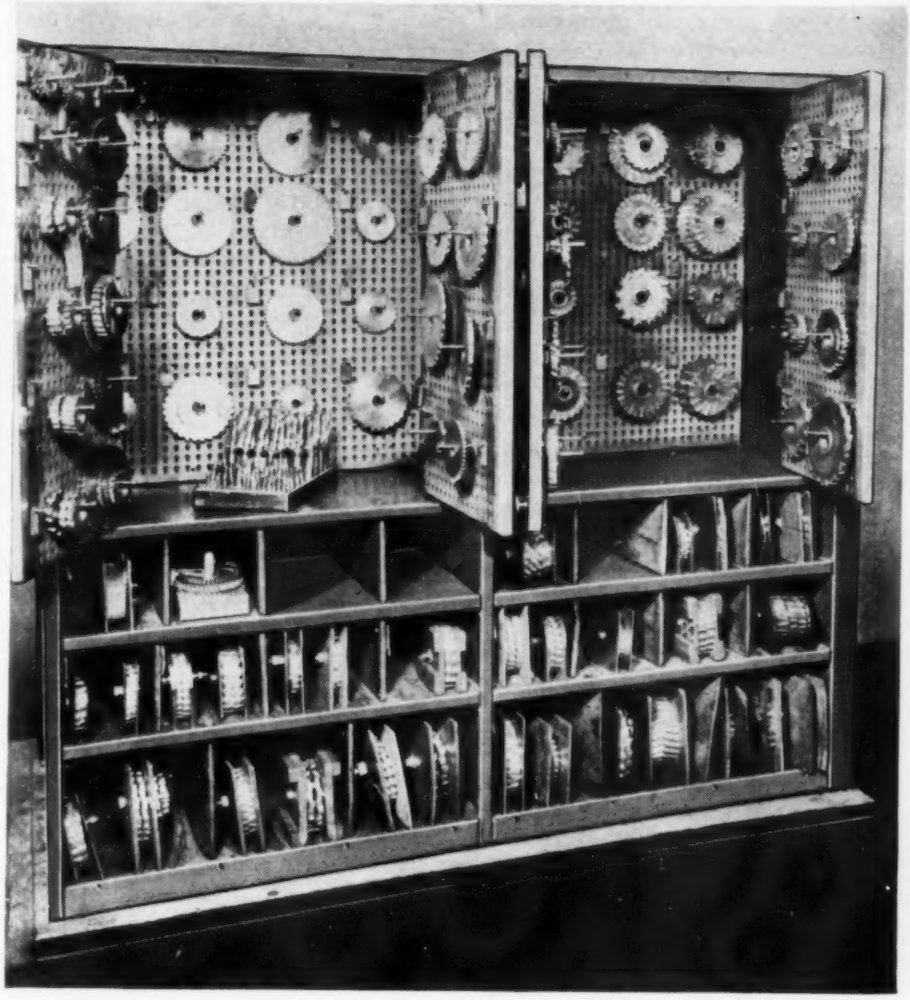
Technical possibilities are considered by a committee consisting of an executive, an engineer, and a skilled shop man. These men do not know the name of the originator of the suggestion; they simply judge if the idea will work, make tests if necessary, and try to judge the idea in value to the organization.

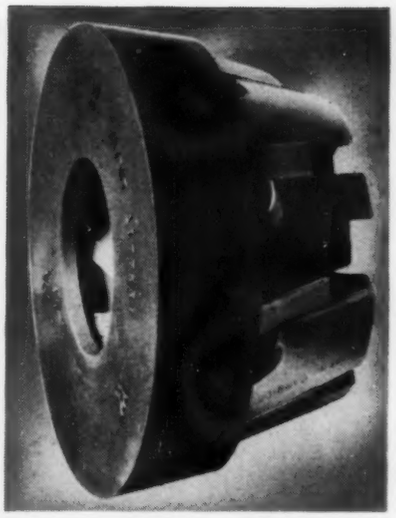
An award committee, consisting of one man from management and two from the employees, determines the reward by using a proportion key. For this they must be informed the position of the originator, and the reward is made to fit his position. A man high in the organization is awarded a small proportion because it is his duty and part of his job to improve the plant, working conditions and the like. A man who suggests an idea that applies to another department is given a high proportion to reward his observation and initiative.

Depending upon the circumstances, the reward may be made in cash, as a paid vacation, a promotion, a book with a dedication from the company, etc. The award should be made during a festive occasion, and a representative from high management should be present to lend honor to the employee.




**Suggestion form** is separated immediately after it is received. Top part is filed and bottom part goes to technical committee. Award committee bases payment on value of the idea and the initiative of the suggestor





**Neoprene boot** protects edges of cutters from nicks and at the same time guards operator's hands from cuts. Boots are inexpensive and will last almost indefinitely

**Standard tool-crib** bin with inserted plywood panels provides safe storage for expensive cutters. Lower section affords storage space for cutters clamped between boards. Note special board for end-mill storage on shelf

# CAREFUL STORAGE REDUCES CUTTER COSTS

**Special bins, boxes and storage racks to protect edges of milling cutter teeth insure longer tool life and lower manufacturing costs**

BY J. W. JONES, Manufacturing Engineer
Headquarters Manufacturing Engineering Dept.
WESTINGHOUSE ELECTRIC CORPORATION

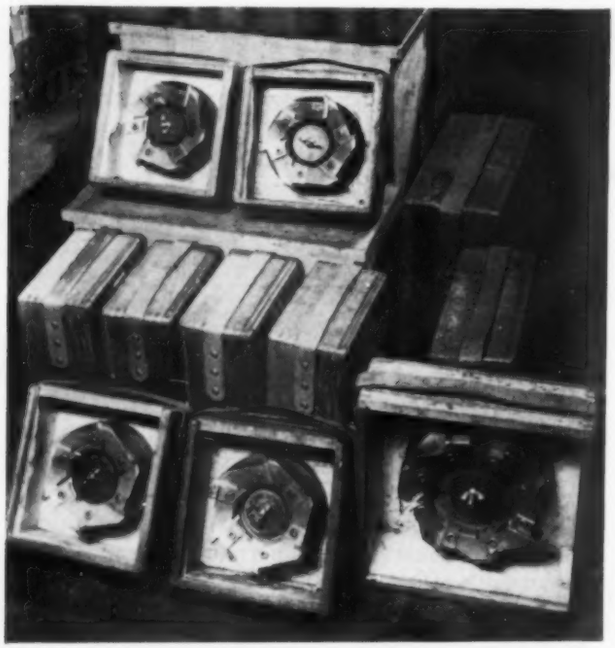
CARELESS handling and storing of milling cutters can account for thousands of dollars in repairs and replacements each year. A little planning and a small investment for proper equipment can save most, if not all, of this loss.

When new cutters are received from suppliers, they are usually well packed to protect them against damage from moisture and handling. Once they have been removed from their original packing, the problem of proper protection begins.

After inspection and checking at the receiving department, they should be re-wrapped to avoid damage to the teeth in transporting to the tool crib. They may be severely damaged if the teeth are permitted to come in contact with other cutters or hard objects or if they are accidentally dropped.

Once the cutters reach the crib, they should never be stored in a manner that permits them to come in contact with other tools. To do so might cause nicking of the teeth with resultant reduction in cutting efficiency. On inserted-tooth cutters, the teeth may be knocked out of alignment. In any case, the damage which arises from careless handling and storage results in delay in production, a regrinding

**Shelf type** of storage board is made by welding short pieces of pipe to steel shelf. Spacing of pegs is planned so one board will hold a variety of sizes. Some of these tools are further protected by ethyl-cellulose plastic coat



**Carbide cutters** are afforded complete protection by wooden boxes with sliding covers and strap handles. Boxes are marked with cutter identification. This method tends to impress operators with the value of the tool

operation, or, possibly, replacement of the whole tool.

Considerable success in reducing these losses has been achieved at Westinghouse by the use of special bins. These are 36 in. wide, 84 in. high, and are available in depths of 12, 18, or 24 in. Special plywood panel inserts are provided for storage of the cutters. These have perforations spaced on 1-in. centers horizontally and vertically, and the pins can be easily adjusted to suit various cutter diameters. The panels provide 27 sq. ft. of storage area. The lower part of the bin is designed with compartments in which cutters and other tools can be placed. End mills can be stored in these bins by providing boards with holes to fit the shanks.

### NEOPRENE PROTECTIVE BOOTS

While numerous devices have been used to protect the cutting edges of tools, one of the newest gadgets that holds promise of success is a neoprene boot*. Designed to fit over the working surfaces of circular cutters, the boot can be slipped into place quickly and remains on the cutter all the time it is not in use. The boot not only protects the cutter but also protects surfaces such as machine tables, bench tops and bin edges that might become injured through the careless handling of a cutter while not in use. It is relatively inexpensive, costing approximately 10¢ for each 1 in. of cutter diameter. This means spending about 80¢ to protect an 8-in. cutter.

In recent years the use of ethyl-cellulose plastic has become very popular. In the tool departments that use this method of protection, a heated container of the material is available at all times. After grinding and inspection, the cutters are immersed in the molten plastic. When cooled, the plastic provides a reasonably durable and atmosphere-proof protection, yet it can be easily removed by peeling.

For a number of years, cover boards made of plywood or soft pine have been used to decided advantage. These are of simple construction, requiring only two boards and a bolt and nut. When plywood is used, no battens are necessary. However, when ordinary lumber is used, batten strips help to reinforce the smaller sizes and provide nailing strips for the larger ones. They also serve as grips to enable the handler to pick up the unit.

With the increased use of tungsten-carbide-tipped cutters, a more positive measure of protection was justified. To meet this problem, special cases were designed. These give complete mechanical protection to the cutter while not in use. Provided with a leather strap for carrying, the case can be easily handled and stored. Each cutter has its own "home" and identification is more positive. The psychological effect on operators is also of benefit. They are impressed by the case, and tend to handle the tools with considerably more respect.

Many machine operations require sets or gangs of cutters. For this type of tooling, a special box or kit is provided. The box is large enough to provide an individual compartment for each cutter, or

* Developed and manufactured by Westinghouse Airbrake Company.

is provided with spacers to place between each pair. In addition to protection, the advantage of ease of checking is effected. If a cutter is missing from the set, it is readily apparent by a quick visual examination. No checking list is needed.

There are many cutters that do not require the special protection afforded by boots, boards, or cases. However, they must be given a reasonable degree of protection. This is provided by special boards with pegs welded in place. Various cutters can be placed on these pegs and the entire board placed against the wall of the crib or any other convenient place. Not only is the cutter kept from becoming damaged, but it is easily identified and located.

Considering the huge investment that multi-tooth cutters represent to the average machine shop or department, a little planning for protection is well justified. Machine operators become more careful and respectful of tools when it is evident that management is interested in their care and protection.

**Safety in handling** and adequate protection of the cutting edges is insured by clamping cutters between two boards with a through bolt. Plywood is adequate for smaller sizes, soft pine serves well for larger items

# FLAME POLISHES PLASTICS

**An oxyacetylene flame can be used for producing polished edges on sawed transparent plastic. It is faster than conventional polishing**

FABRICATORS of plastics have developed a new use for the oxyacetylene flame in finishing sawed edges of these materials. Sawing produces an opaque surface which must be made clear again. Although sanding, buffiing, and polishing with powder or rouge was previously necessary to restore this transparency, the new procedure requires only a minimum of sanding and one or two rapid passes of the oxyacetylene flame over the sawed surfaces. This treatment produces an improved finish in less time and at considerably less cost. Flame-polishing also removes surface scratches and other minor imperfections.

The flame-finishing procedure has been successfully used on methyl methacrylate resins such as Plexiglas and Lucite, on polyethylene, and on Amphonal—one of the styrene plastics. Trials with a number of other plastics produced undesired distortion. The same treatment applied to polystyrene, however, develops a crazed surface that may prove useful for decorative purposes.

In some cases, the transparency of rough-sawed surfaces is restored by flame-finishing without further treatment. In others, flame-polishing is preceded by sanding with a wet or dry sander, using 180-grit paper followed by 320-grit paper. The sanded but still opaque edges are then blown or wiped clean of fine particles.

A standard W-29 welding torch with No. 12 head is adjusted to produce a highly oxidizing flame for the polishing operation. Plastic parts are positioned in a jig or on a flat bench surface so the edge to be polished lies horizontally. The flame is kept approximately 3 in. above the surface of the piece. A sweating action, produced by the sweep of the excess-oxygen flame, imparts a high, smooth polish as transparent or translucent as the base material. Dipping the part in water immediately before applying the flame sometimes adds to the appearance.

Rough-sawed, unsanded edges usually require two passes of the flame at a speed of 10 to 20 fpm. The first pass removes saw marks and imperfections, the second leaves a crystal-clear surface. Material 1 1/6 to 2½ in. wide, which has been sawed and rough-sanded, requires only one pass of the harsh, oxidizing flame at a speed of 40 to 60 fpm. in most cases.

A No. 6 head is frequently used with the W-29 torch for finishing narrow surfaces. Flame adjustment is provided by regulating acetylene pressure at ½ psi. and oxygen pressure at 50 psi. For widths greater than ⅜ in., however, two or more adjacent passes of the flame may be needed even on sanded surfaces—each pass covering an equal part of the width of the material.

Clear concave or convex edges are easily formed with an excess oxygen flame when copper chill bars are placed on either side of the edge to be finished. If the bars are brought up flush with the edge of the material, a slow pass of the flame across the edge produces a polished concave surface. If the bars are moved back about ¼ in. from the edge, the same procedure produces a convex surface. Such chill bars also can be used in polishing square edges by setting them back slightly from the edge and passing the flame rapidly over the plastic surface. The chill bars, however, are not necessary for most ordinary flame polishing work.

# MOTORIZED WHEELBARROWS ROLL THROUGH STRAIGHT-LINE LAYOUT

**Components machined in clever setups**

BY ARTHUR HESS,
Superintendent
BELL AIRCRAFT CORPORATION

FINAL assembly of Bell Aircraft's new Prime Mover is performed progressively on a specially designed bench 120 ft. long. Adjacent to the line and located so material will feed in where needed are subassembly and machining groups. Machine setups produce requisite precision, yet are economical of operator time and effort.

The special bench is 30 in. wide, 24 in. high, and 120 ft. long. Its top has three parallel steel channels that guide the wheels of the Prime Mover as it is moved along from station to station. Between the channels are fitted two 8-in. wide boards that provide a surface for holding tools and parts. Paralleling the line, on each side, are racks to hold the parts needed at each station. Parts are placed in these racks from adjacent subassembly benches that parallel the final assembly area. The last 10 ft. of the main bench is an inclined ramp on which finished units move to floor level for

**Bucket body** of Prime Mover has 10-cu. ft. capacity, is interchangeable without tools with a platform deck. 3-hp. air-cooled gasoline engine drives the two front wheels through clutch and transmission; no chains or belts are used. Maximum speed conforms to fast walking pace

**Assembly station** is paralleled by supply racks. Tools and parts also are placed between the guide channels on the bench

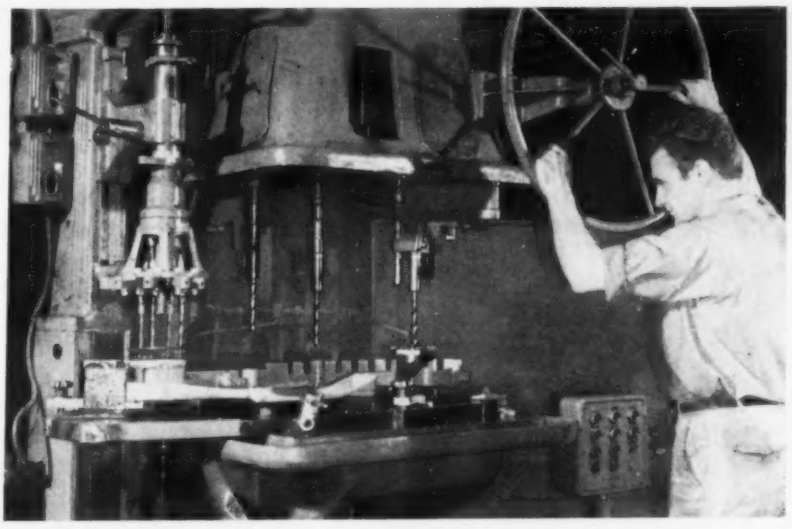
**Inspection station** has rollers to permit running engines and drives. A cover is swung over the exhaust muffler so fumes are removed by blower through the vertical stack at right

**Final assembly** is performed on the special bench, center. Engine, clutch, and transmission subassembly, complete with wheels, is moved to the line from the assembly bench at right. Subassembly, consisting of machined side-frame castings, rear cross-frame casting, and handle with control levers, is built on the bench at left. This is dropped into position over the engine unit at the head of the line. Handling is done with an electric hoist. From here, the assembly travels from station to station through carefully balanced operations to inspection

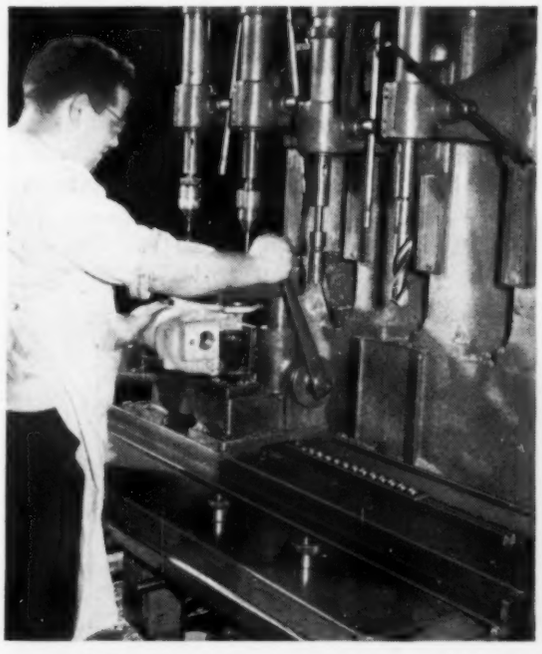
the final inspection and painting operations.

The completed vehicle has capacity for 1,000 lb. of wet or dry materials, is capable of climbing a 20% grade with full load, and can be changed to a platform carrier without tools. The unit is 35 in. high, 63 in. long, 31½ in. wide and turns in its own radius.

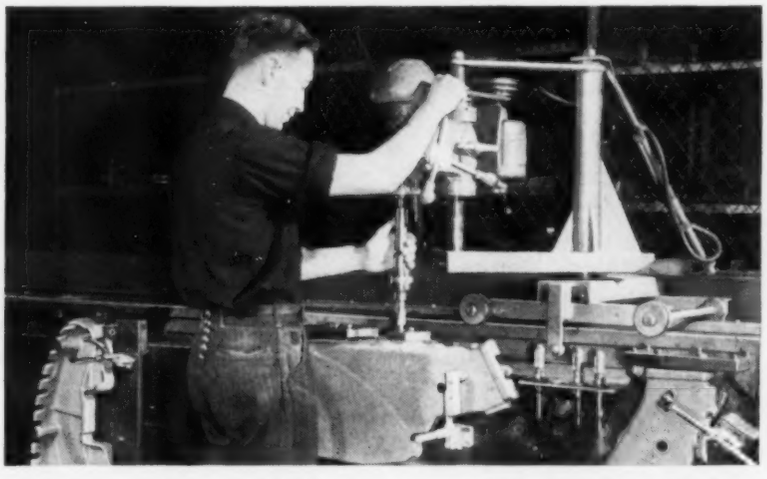
The assembly line and several machining setups are shown in the accompanying photographs.



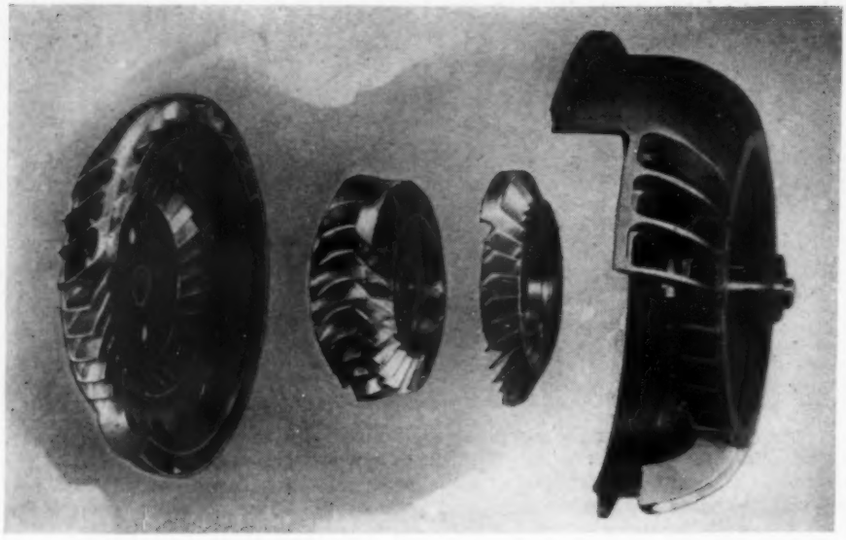
**Multiple-spindle** press drills three ⅝-in. dia. holes in aluminum side-frame castings. While the machine cuts under power feed, the operator drills four 5/16-in. holes in end of casting with single-spindle machine, left, equipped with multiple-spindle head. This drillpress is mounted on a platform to raise it to proper height. Different jigs are needed for right- and left-hand sides



**Four-spindle drillpress** drills and reams two locating holes and a mounting hole on cast aluminum transmission case. Cam-locked jig is moved between guide rails from spindle to spindle on two lines of ⅞-in. dia. balls mounted in grooved rails bolted to the drillpress table. Balls are spaced 1¼ in. apart in bars drilled for a loose fit



**Rail drill** on 20-ft. bench drills, reams, countrebores and taps periphery holes on side-frame castings. Seven jigs, with quick-acting toggle clamps, position castings along bench. Drillhead on carriage has Magic chuck for rapid tool changes



**Intricate rotors** that compose the Dynaflow torque conveyor are partially sectioned to show construction. Left to right: turbine, reaction members, secondary pump, primary pump

# Dynaflow Rotors Cast in Plaster Molds

**The Antioch process, not to be confused with lost wax, provides a means of making intricate aluminum castings with smooth surfaces held to close tolerances**

BY CHESTER RICKER
DETROIT EDITOR

INTRICATE aluminum castings in production quantities are now cast in plaster molds at the Allison-Bedford Foundry, in Bedford, Ind., operated by the Allison Division of General Motors Corporation. This method of production is concentrated in one section of the foundry which is devoted entirely to the production of torque-converter parts for the Buick Motor Division.

The five Buick Dynaflow-drive torque-converter rotors are of the turbine-blade type and vary in intricacy and size. Top production men at General Motors reviewed every alternative production method and estimated cost of tooling for producing these units in steel was ten times what it actually cost to prepare the core boxes and other equipment required to make these castings.

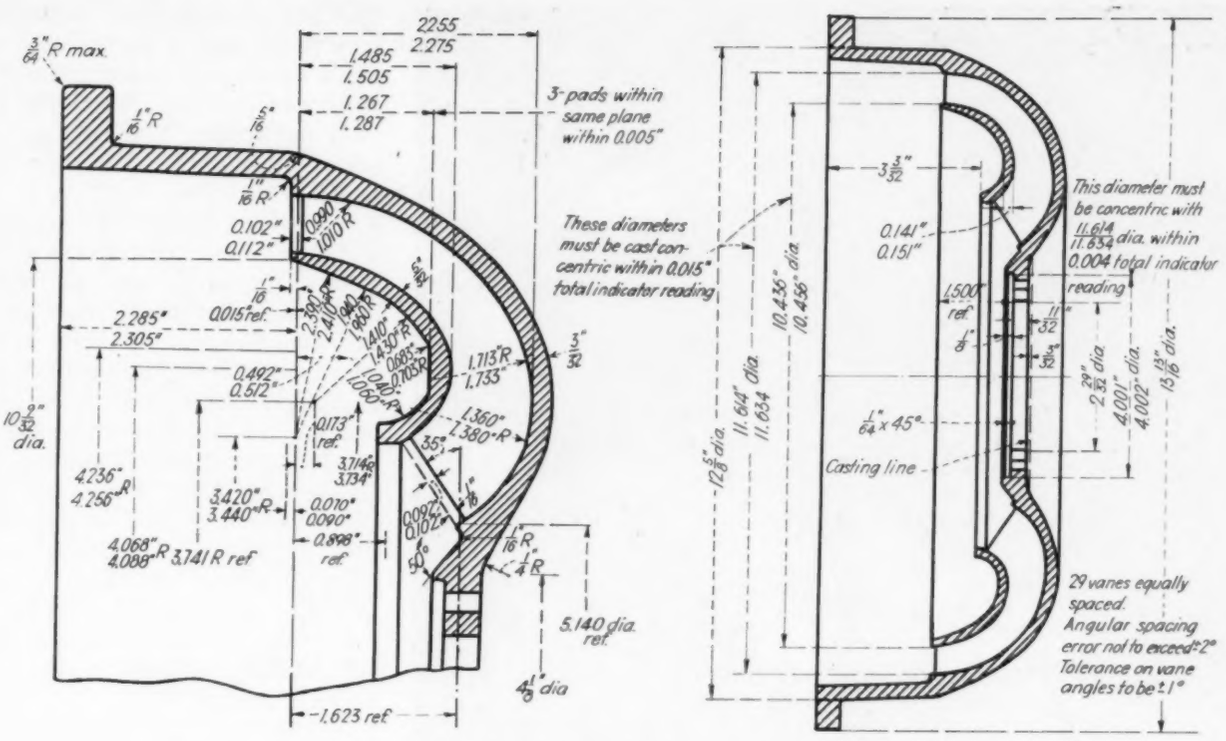
This method of plaster molding aluminum-alloy castings requires the closest technical, scientific, and operational control of metal, melting and pouring processes, and heat-treatment of finished castings. It involves proper preparation of plaster mixtures, special plastic core boxes, precision assembly of cores, and careful curing before molds are poured.

Plaster molding, as practiced at Allison-Bedford Foundry, was perfected at the Antioch Foundry during the war, and was used in the production of Allison and Packard Rolls-Royce cylinder heads. Although the foundry is on the Antioch College campus, it is not part of the college organization. Actual investigations on aluminum molding and pouring in plastic molds started about 1935 and were taken over by General Motors and operated by the latter during the war period. The method is said to have cut scrap losses from metal porosity and inaccuracies in casting from over 30% to less than 1%.

This Antioch process of plaster-molded aluminum alloy castings has several advantages which make it desirable in applications of the type described here:

1. Close dimensional uniformity "as cast". (±0.010 in. in 12-in. dia.)
2. Exceptional smoothness due to plaster molds. (Do not require subsequent machining.)
3. Freedom from porosity. (Must hold hot oil under high psi.)
4. Homogeneity of metal improves fatigue resistance.
5. Physical properties comparable to sand-cast iron.
6. Tooling investment lower than for comparable fabricated-steel designs.
7. Easier to make improvements or changes in initial design.

Naturally, the Antioch process costs more per pound than ordinary ferrous or aluminum sand castings, but when one contemplates what it would cost to do it otherwise, it is cheaper. For example suppose the turbine blades and component parts had to be separately machined and formed. (Blades are so shaped that they could not be machined in position after assembly. Neither can they be stamped from sheet steel, but must be forged, for they vary in thickness from 1/64-


3" pads within same plane within 0.005"
These diameters must be cast concentric within 0.015" total indicator reading
This diameter must be concentric with 11.614 11.634 dia. within 0.004 total indicator reading
Casting line
29 vanes equally spaced. Angular spacing error not to exceed ±2° Tolerance on vane angles to be ±1°
5.140 dia. ref.
1.623 ref.

**Primary pump** is typical of the close tolerances required in casting Dynaflow rotors

in. radius at tips to 0.075- to 0.090-in. at the thickest section.) Machining and assembly operations would be complicated. The kind of fixtures and dies required are extremely expensive today. Last, but not least, is the necessity of freezing the design when such expensive tooling is required. This is particularly undesirable when a product is new like the Buick Dynaflow drive in which these castings are used. It may take three or four years to determine the very best blade shape in a turbine of this kind. A production process which does not restrict development is welcome at such times.

The two important factors in making good plaster-mold castings are the metal quality and the character of the plaster mold.

At Bedford, they refine the aluminum alloy, which is made from secondary aluminum. In the first furnace, they melt both ingots and gates, sprues, risers, and other rejects. This furnace is kept at low temperature long enough to drive off hydrogen and allow heavier impurities to precipitate in the melt. Metal from this refining is poured into ingots which are remelted in crucibles for pouring castings.

The second melting is in a series of 600-lb. crucibles charged with

**Plastic core boxes** are hinged so they can be removed from the molds without damaging them

**Release oil** is sprayed over core boxes so plastic molds will not stick and cast surfaces will be smooth

**Automatic mixer** adds water in controlled amounts just before slurry is hosed into molds. The mixer fills molds on three conveyor lines

**Cores are assembled** on this line. Cores and mold parts are delivered by overhead conveyor. Girls slide finished assembly onto conveyor belt

400 lb. of the ingots previously refined. When melted the charge is allowed to stand while dry nitrogen is allowed to bubble through the molten metal. This treatment reduces the hydrogen content in the melt. This was found necessary to get the homogeneity necessary for these castings. Pouring temperature is kept very close to 1400 F. (only about 25 F. maximum variation is allowed). All pouring is by gravity from hand ladles which are constantly checked by pyrometer before and during pouring.

After molds are shaken out, sprues and flash are removed. Initial inspection follows, then vapor-blasting at 100 psi. air pressure with 100-mesh wet grit. This is the only finish and is sufficient to remove all plaster which adheres to the cored passages. Then there is final inspection. The castings are passed through heat-treating furnaces, where they are held at 940 F. for 6 hr., quenched in boiling water and aged for 5 hr. at 470 F.

Making plaster cores and molds is just as scientifically handled as the preparation of the metal. Molds are made from gypsum, but pure gypsum mixed with water is valueless for two reasons: the hardened plaster is impermeable and too dry. Unless the mold is porous, hot gases cannot escape, so resulting castings are full of blow holes. Pure gypsum is an excellent heat insulator. It traps the heat in the poured metal, which therefore does not solidify quickly enough to make a smooth casting that faithfully follows the mold contour. Let's see how easily the Antioch process overcomes these two problems:

### *Automatic Mixer*

Porosity of the gypsum mix is obtained by adding some sand, a chemical inhibitor which protects the plaster from the hot metal, and an accelerator which controls the rate at which the mixture sets. Proper amounts are proportioned by weight and mixed dry, then a metered amount of water added to assure the proper consistency of the resulting slurry. By using this automatic wet mixing machine, water may be added to the dry plaster mix at any production rate required. The mixture becomes part of the pouring system. Provision has been made so it can be flushed out with fresh water if it is not in use for more than ten minutes.

The subsequent curing of the molds, which takes 48 hr., is so carefully controlled that one of the two molecules of water of crystallization required for the mixture is retained in the mold. Then when the hot metal hits the mold walls, this remaining water of crystallization turns to steam—cooling the casting surface, or chilling it so that it exactly conforms to the mold. Because the mold has been made permeable, steam thus

formed escapes wthout impairing the quality or accuracy of the casting.

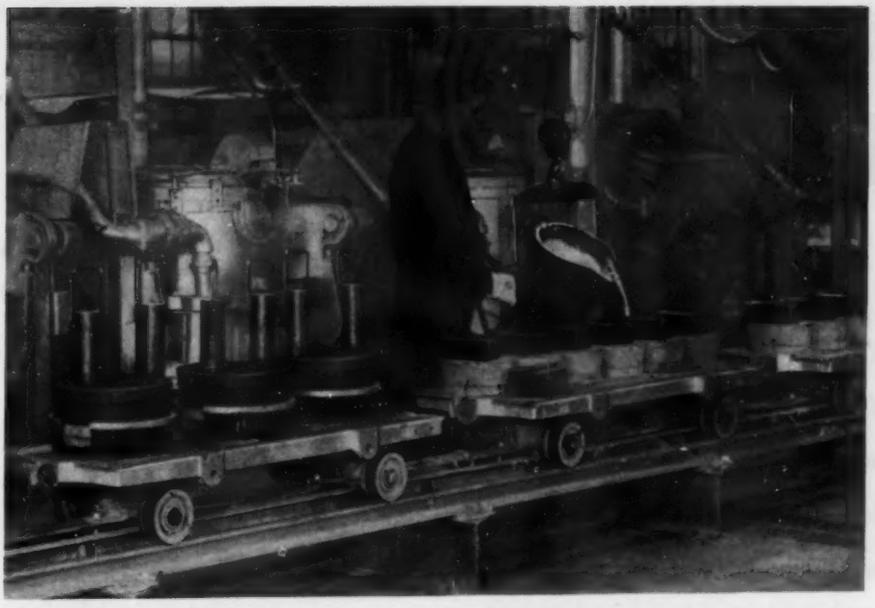
Plaster molds, when removed from their core boxes, are sprayed with kerosene to prevent their drying too rapidly and allowed to stand in racks at room temperature for 6 or 8 hr. Then they are steam cooked in an autoclave for 8 hr. at 17 psi. pressure. Next they are allowed to stand for 12 hr. at room temperature. Finally they are baked in ovens at 400 F. for 20 hr. When cool again, they are ready to pour.

The need for accuracy in these plaster molds, which form the turbine passages, is so great that ordinary methods of making them cannot be used. Cores for the turbine passages must be exact to 0.001 in. Thirty of them have to be assembled on a ring about 11 in. in diameter. Unless the core prints are held within 0.001 in., the assembler ends up with insufficient room to get the last core in the ring assembly.

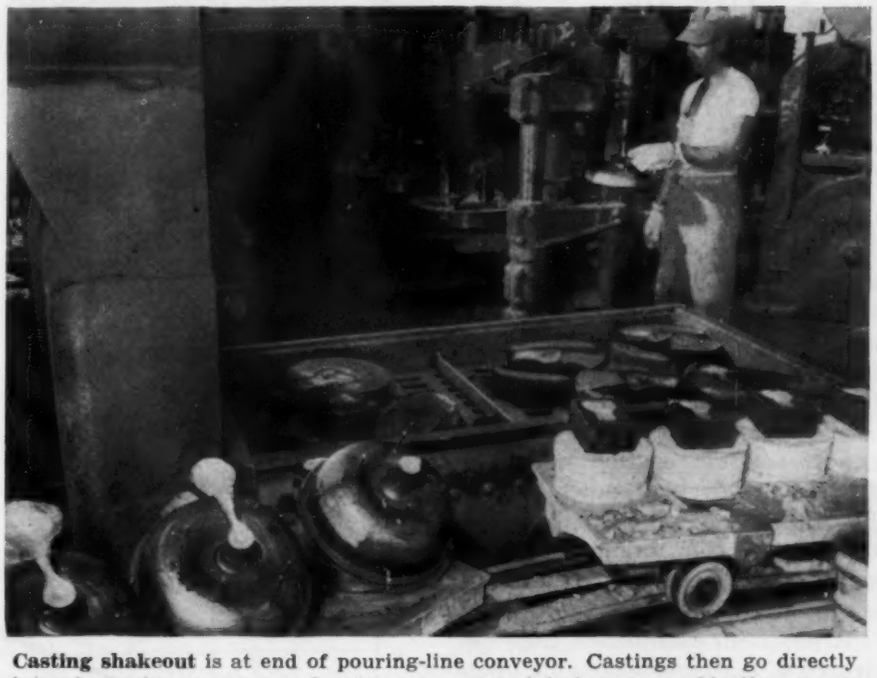
To get uniformity of individual plaster cores, it was found necessary to make core boxes from plastic that maintains its dimensional stability in use and accurately reproduces the shape of the model. Making a set of core boxes is like spotting a new set of fender or body dies. It's cut-and-try job until things are just right. Allison-Bedford Foundry maintains a pilot-line department where this can be done easily. Then when the job gets on the production conveyor line, there are no production hold-ups.

In the final machining of the castings at Buick, only the hub and mating flanges need be machined. There is no machining on any of the turbine-blade surfaces, which are quite smooth enough in the "as cast" condition. All blades are integrally cast with the hub and outside ring or housing.

It is evident why such accurate aluminum castings have been chosen instead of fabricated steel. It also points the way to production of other things which would be impracticable by other production methods.

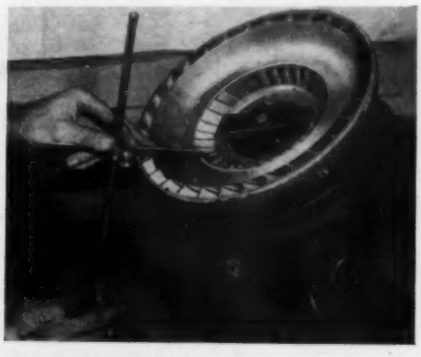


**Assembled molds** are put on conveyor which carries them to metal pouring line, then on to casting shakeout



**Casting shakeout** is at end of pouring-line conveyor. Castings then go directly into shop where sprues and gates are removed before vapor blasting to remove plaster which sticks to the castings

**Porosity** shows up by air bubbles when water is sprayed over surface. This inspection is made 100%



**Dimensional check** is made with gage crib. Inspection of production castings is required to hold close limits

# Rapid Determination of Carbon Content in Steels

**Discrepancies in heat-treatment of particular lots of parts can be accounted for by converting maximum hardness of a quenched sample to the carbon content**

BY P. A. HAYTHORNE,
Research Metallurgist,
LOCKHEED AIRCRAFT CORPORATION
and BURTON R. PAYNE, JR.,
Field Engineer,
A. F. HOLDEN COMPANY

CONVENTIONAL chemical analysis of steels is too costly and time-consuming for the heat-treater. The laboratory metallurgist often needs a simple expedient to find carbon content of steels under investigation. And chemical analysis is impractical for identification and segregation of steels from mixed stock of known grades. But there is a reliable and quick method for determining the carbon content of the common heat-treating grades of steel.

It has been established that the degree of hardness attainable upon quenching of steels increases with carbon content. The maximum hardness attainable is largely independent of other alloying constituents. Their presence and grain structure determine only the facility with which maximum hardness can be obtained.

The procedure for determining carbon content involves: (1) quenching a sample from above the critical temperature to *known maximum obtainable hardness*, (2) measurement of hardness and (3) direct conversion of hardness to percentage carbon content using the curve herewith.

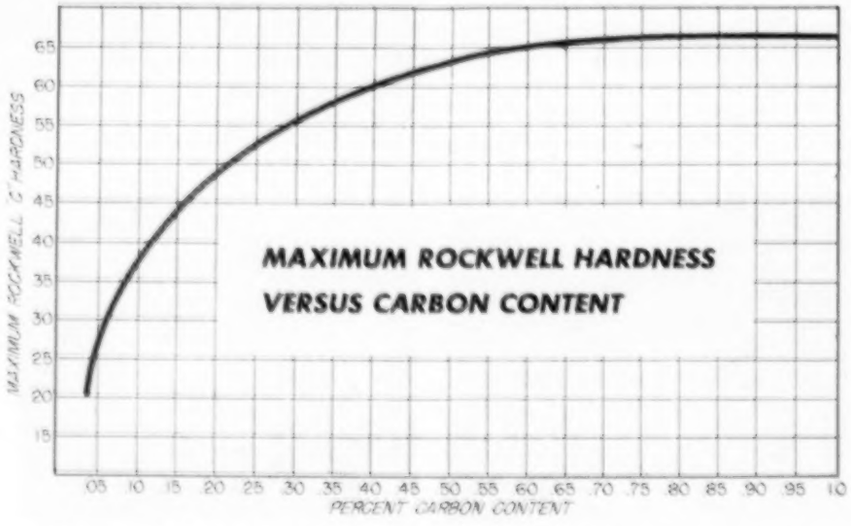
This is a destructive test entailing the selection of a sample from an area of the part, bar, forging or other shape which is reasonably typical in composition of the material in question. Efforts should be made to avoid sectioning in areas prone to segregation during original solidification, also at mill surfaces and exposed faces subject to decarburization, carburization or other surface phenomena.

The specimen for "quench carbon" check must be of sufficiently small size to insure cooling upon quenching at a rate in excess of critical. A suitable and convenient size of piece is generally $\frac{3}{8} \times \frac{3}{8} \times \frac{1}{4}$ in. or less, and with opposite sides ground to approximate flatness before heating.

The heating of specimens to effect complete solution may be carried on in any type of furnace capable of temperatures from 200-300 F. higher than normal quenching temperatures without incurring an undue amount of scaling, decarburization, carburization, or absorption of gaseous elements by the piece. With practice, a bunsen burner may be employed successfully. This is true because actual quenching temperature and time of soaking do not appear to be critical, provided that complete solution of carbide is attained prior to the quench.

Test samples are quenched as quickly as possible, and with violent agitation, into water, brine or iced brine, depending upon the steel in question. For most medium-alloy and low-to-medium carbon steels the water quench will produce maximum hardness, but for many water-hardening grades of low hardenability the brine quenches will be necessary.

Following quenching to room temperature (or preferably below, in some instances) specimens are




**Carbon content** of the questioned steel is estimated with good accuracy from this curve. Maximum hardness of the sample is obtained by quenching from a suitable temperature based on the suspected range of carbon content

reground to parallelism of the flat sides. Extreme care must be exercised to avoid overheating of any portion of the "as quenched" structure. Grinding may be done dry and by hand, or mechanically under wet grinding wheels. Sufficient metal must be removed to guarantee a test surface without surface scaling, enrichment by carbon or carbon depletion. Smoothness of test faces must be of such degree that hardness values are of maximum consistency and are unaffected by uneven surface.

Testing for hardness of quenched specimens is generally done with a standard Rockwell machine with conical diamond indenter (A or C scale). Other machines using diamond penetrators (Vickers, etc.) may be satisfactory, but values obtained will require conversion. The use of ball-penetrating types of testers is not recommended because of insufficient accuracy at the high hardness levels involved in this particular test.

The usual precautions must be exercised in hardness testing: Machines should be checked against standard blocks. When using a Rockwell machine, it is particularly important that no vertical movement occur with application of major load. A sufficient number of hardness tests should be made to duplicate higher values. In addition, it is desirable in most instances to check readings obtained under different loads.

Frequently it has been observed that some steels will crack in the "as quenched" condition as a result of stresses developed by impression of diamond indenters and heavy load application. Therefore, it is well to examine indentations at magnifications of 5-20X to verify that accuracy of hardness values has not been adversely affected by superficial cracking not visible to the eye. When cracking is encountered, the use of lighter penetrator loads is indicated. In the event of excessive discrepancies between hardness readings, specimens may be re-quenched and checked as before, until satisfactorily consistent values are obtained.

In the conversion of maximum hardness to terms of carbon content, the curve shown is employed. This is a composite curve based on the original accredited to Burns, Moore and Archer, but slightly modified according to Navy Department studies and investigations in the authors' laboratories.

From study of this curve, it is evident that accuracy of correlation diminishes rapidly with increase of carbon content above 40-45 points of carbon. Above that range, normal (and anticipated) error of hardness readings will result in excessive error in conversion to carbon percentage. Conversely, wide variations of hardness in the range below C35 will yield small variations in carbon content upon conversion. Use of this curve at extremes of carbon content and hardness is not generally advocated for applications requiring accurate determinations, but its accuracy with common heat-treating grades (0.15-0.45% carbon) is satisfactory for most purposes.

### Good For Common Steels

A question of test accuracy may be raised with respect to the proneness of some steels to retain austenite upon the drastic quenching required by the described testing procedure. In this connection it may be found necessary or expedient to subject specimens of high-alloy steels to sub-zero treatment to effect maximum quench hardness. Fortunately most heat-treating grades (low and medium alloy), and those in carbon ranges where the quench method is most suitable, are not in this category.

That the retention of austenite has had no appreciable effect upon carbon determinations of steels selected for illustration herein is shown in the table. It can be seen that alternate sub-zero treatment (to —120 F.) and tempering 200 F —250 F. has not effected transformation of retained austenite to martensite, as indicated by any increase in hardness in excess of normally anticipated error of Rockwell test readings.

Although apparent discrepancies between checked carbon content and carbon percentage by analyses may be considered excessive (SAE 4150 and 6150), it is emphasized that the value of the test lies in predicting the response of a particular steel to heat-treatment. It is also observed that conventional carbon analyses are often subject to slight error. When this is considered, coupled with possible slight inaccuracies of hardness testing and subsequent conversion of values to carbon content, the cumulative effects of error must be appreciated. However, extant deviations as indicated may be considered of minor consequence in relation to the ultimate value of the "quench carbon" method.

**RELIABILITY OF "QUENCH-CARBON" METHOD**

| STEEL | HARDNESS, ROCKWELL C | | | CARBON CONTEST,— | | |
|---|---|---|---|---|---|---|
| | 1 PREDICTED | 2 TEST RESULT | 3 SUB-ZERO | 4 ACTUAL | 5 ESTIMATED | 6 ERROR, % |
| N. E. 8617 | 47 | 45 | 45.5 | 0.18 | 0.16 | 11.1 |
| SAE X1020 | 48 | 46 | 46 | 0.19 | 0.17 | 10.5 |
| SAE 4130 | 55.5 | 54 | 54 | 0.30 | 0.28 | 6.6 |
| SAE 4130 | 56.5 | 55 | 55.5 | 0.32 | 0.30 | 6.2 |
| N. E. 8630 | 57 | 56 | 57 | 0.33 | 0.31 | 6.0 |
| SAE 1137 | 58.5 | 58 | 57 | 0.37 | 0.35 | 5.4 |
| SAE 4340 | 60.5 | 61 | 62 | 0.43 | 0.43 | 0 |
| Nitralloy G | 61 | 61 | 61 | 0.44 | 0.43 | 2.3 |
| SAE 4140 | 61.5 | 62 | 61.5 | 0.45 | 0.46 | 2.2 |
| SAE 6150 | 63 | 64 | 63.5 | 0.50 | 0.54 | 8.0 |
| SAE 4150 | 64.5 | 65 | 65 | 0.57 | 0.62 | 8.8 |
| SAE 52100 | 66 | 66 | 67 | 0.96 | Over 0.70 | —— |
| SAE 1095 | 66 | 66 | 66 | 1.01 | Over 0.70 | —— |

Col. 1—Maximum hardness predicted from curve, using analysis of steel.
Col. 2—Maximum hardness obtained by "quench-carbon" method.
Col. 3—Effect of sub-zero treatment on maximum hardness from quench.
Col. 4—Carbon content of steel by analysis.
Col. 5—Carbon content of steel estimated by "quench-carbon" method.
Col. 6—Error in carbon content by "quench-carbon" method.

# ROUND TABLE

## Talk or Sweat First?

"Had a good chat with the new man yet?" asked Al as he joined Ed at the lunch table.

"Good chat!" grouched Ed, nearly choking on his coffee. "I've got more important things to do than indulge in yak-yak with a new man."

"So you think having a talk with an unknown is unimportant, do you?"

"What do you think?" replied Ed. "The man's hired to work, not to talk."

"That's the main objective, all right, but—"

"But what? That's what he was doing, last time I saw him, so he's doing all right as far as I can see."

"Don't talk with your mouth full, Ed. I was about to say that while work is important, we shouldn't forget that an entire stranger needs some diplomatic checking before he can be considered a dependable employee."

"The time to put a man through this third degree you call 'diplomatic checking' is before you hire him," Ed argued. "I figure that when they turn a man over to me he's hired to work with no questions asked."

"Now don't get me wrong, Ed; I'm not proposing an espionage or Gestapo system. You wouldn't use a piece of tool steel of unknown make without testing it some way, would you?"

"Well, what do you want me to do, have the fellow give me a diagram of his family tree?"

"No, I wasn't thinking of going that far," laughed Al. "I've found that a confidential chat with a new man always gave me a chance to know him better, and that doesn't do a bit of harm these days."

"We get his card from the front office, don't we? I've got a certain amount of confidence in the employment office. Anyhow, what do you expect to gain from this little chat?"

"Well, to be truthful, I'd like to find out as early as possible if the man's a Pink or Red, what his personal ideas are. I want the two of us to gain confidence in each other, so we both start off on the right foot."

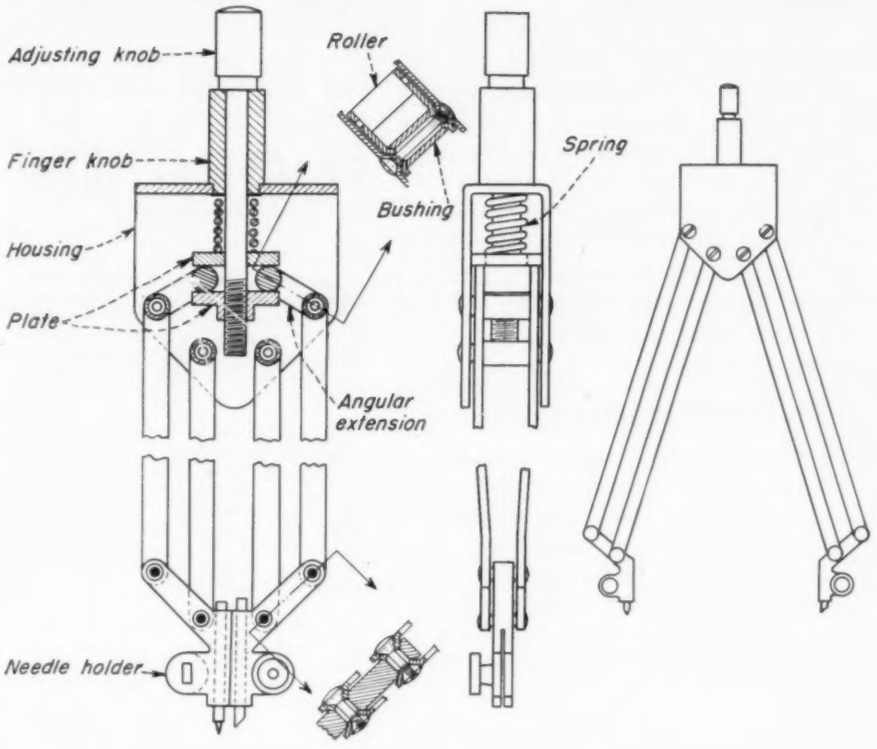
"I still say that my job is to get work out of the men—not their philosophies."

"If you're not on your guard, you'll get more—or less—than work out of some of them."

"Horsefeathers!" Ed rose to start back to his shop. "I'll get the work out; you worry about infiltration and psychiatry. I'm too busy with my own work to have truth parties."

***IS THE "PSYCHOLOGICAL APPROACH"*** *of help in orienting the new employee, or is the older idea of "rubbing his nose in the job" better? Does a personal chat help to start a new man off? What are your opinions and experiences? Discussions of earlier topics appear on later pages.*

# Practical Ideas




## Pantograph Leg Linkage Adapts Special Compass for Blueprinting

HEAVY, BLACK LINES that will show up for tracing and blueprinting can be drawn with a special compass which incorporates a pantograph linkage in its legs. The mechanism keeps both pivoting needle point and marking lead in vertical positions at any radius. In addition, heavy pressure can be applied without the compass spreading because of a positive, screw-fed radius adjustment.

The legs are built up from scrap strips of duralumin and work in pivot bearings in the top housing and the needle and lead holders at the bottom. All joints are made with small bolts and nuts in chamfered holes in the linkage.

The two holders are the conventional split type with small thumbscrews that clamp the needle and lead. Extensions of the holders are drilled and are attached to the legs.

The top housing is made of duralumin, bent to shape. A holding collar is fitted to the housing, and inside this an adjusting screw, topped with a knob, works to spread the legs. Angular extensions on the double-strip legs are connected through rollers that ride between two bearing plates. The upper plate is spring loaded from the top to maintain pressure on the roller. The bottom plate is drilled and tapped to work on the adjusting screw. Thus, up and down motion of the screw closes and opens the legs.

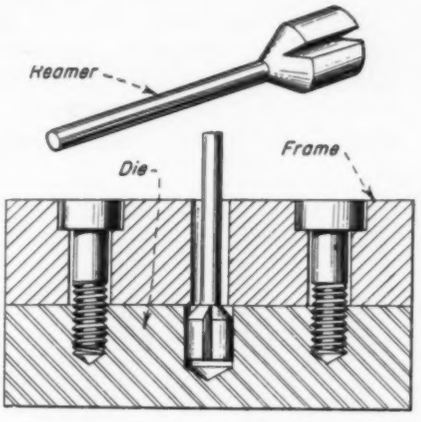
At the housing, the legs are bolted inside the covering plate, and are separated by spacing collars. All joints are made strong by crimping the hole edges of the legs down into the chamfered holes in the collars and the holders.

For fast closing action, the legs can be pressed together and the knob on the top can be spun until the slack is taken up. *Clifford T. Bower, Decatur, Ga.*

## Reverse Reamer Transfers Holes

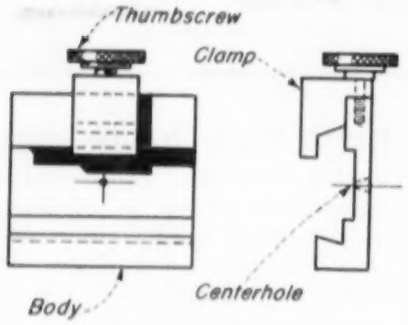
ON AN OCCASION when I had to dowel and screw a hardened, ground molding die into a soft-steel die frame, I employed this method for transferring blind die holes to the frame.

The screw holes were laid out on the frame and drilled about 1/32 in. oversize. The dowel holes were also laid out and drilled, but 1/32 in. undersize. A special set of reamers was made and inserted through the frame holes from the die side and the two parts were assembled.




The reamers are made with shanks 1/16 in. smaller than the dowel holes and long enough to project through the frame and be gripped by the drillpress chuck. The cutting edge was about ¾ of the depth of the blind hole, and the cutting lip was made at a 45° angle. Actually, the first reamer made this way was slotted with a hacksaw and cleaned up with hand filing. The material was drill rod, hardened after it was formed to shape.

The assembly was clamped to a drillpress table and the shank of each reamer was engaged in turn with the drillpress chuck. The reamers were pulled out as they rotated, and since the two parts were free to "shake," the reamers cut the full-size holes directly in line with those in the die. *Thomas Patell, Camillus, N. Y.*




### Scale Tool Locates Bolt Circle

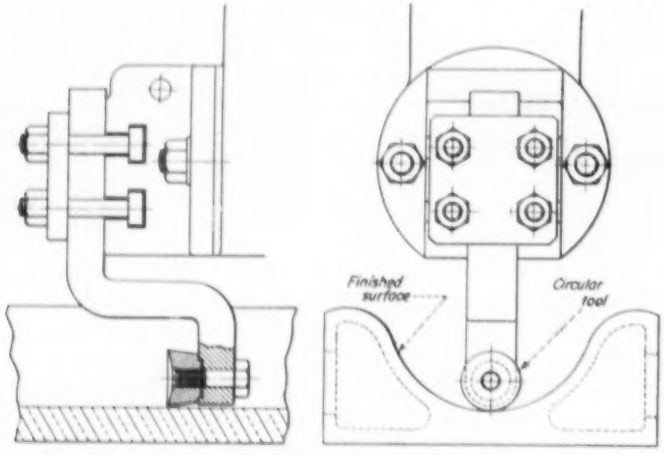
SCRIBING DIAMETERS on work faces and measuring across them can be done while the work is still in the lathe if a suitable attachment is made to fit on a long scale. This one clamps on a machinist's scale and can be centered over the point of the tailstock center.

The original block was 1 in. wide and 1½ in. high. An 8-32 thumbscrew held the top clamp down on the scale. The centerhole, aligned with the tapped hole for the thumbscrew, was drilled out at 60°, and just pierced the wall of the block. This hole is fitted over the center.

Both surfaces that gripped the edges of the scale were cut at a slight angle—to clamp the scale in on the block. Setups are made by centering the block over the tip of the tailstock center and moving the tailstock up to the face of the work. Bolt circles can be scribed by rotating the chuck by hand and holding a scriber and the scale with the other hand. *Harold W. Cutting, Lompoc, Cal.*

### Drills Ground in Lathe Spindle

TWIST DRILLS with tapered shanks can be easily ground by setting them up in the spindle of a small lathe. Grinding is done with a standard lathe attachment. An adapting collar must be used if the spindle and drills have different tapers. *Michael Axler, Bronx, N. Y.*




## Goose-Neck Cutter Planes Curved Surfaces

CURVED SURFACES on a tough steel casting were planed with this gooseneck tool. The shank is a steel forging, and the conical cutter was made from 18% tungsten, high-speed steel. The cutter was hardened and ground all over and was lapped at the cutting edge.

Depth of cut was from 0.007 to 0.010 in. A lubricant was made by mixing soluble oil and grain water in proportions of 1 to 40. The resultant cut was bright and smooth, free from chatter marks even though the planer itself was old.

Tool life is greater than that of a forged tool or a brazed-tip tool, and the cutter is easy to keep in good shape. After it has become dull on one section of the edge, it is rotated about 90° to present a new edge to the work. In this manner, four new edges can be used with only one setup and grinding job. *G. R. Milner, Gainsborough, England.*

**$25** *In addition to regular payment*

## for the best PRACTICAL IDEA

**An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.**

**PAYMENT**—**$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.**

**JUDGES** — **A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.**

**REQUIREMENTS** — **Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.**

**WHO MAY ENTER** — **Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.**

**HOW TO ENTER** — **Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.**

64TH WINNERS — A TIE:

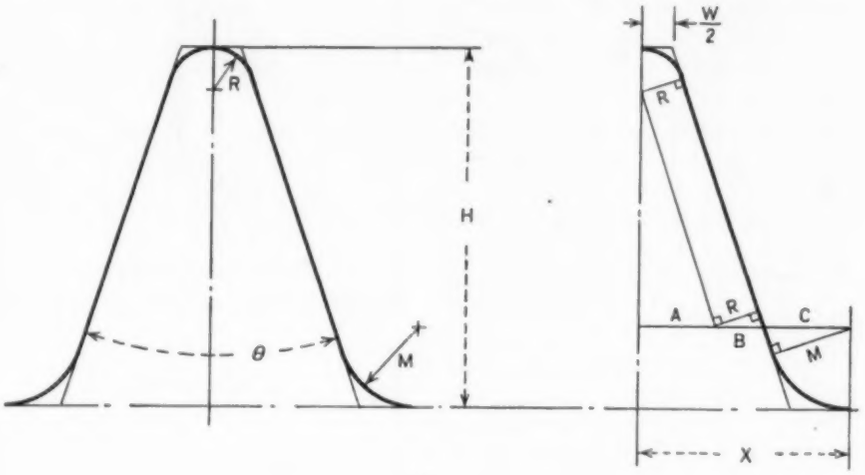
G. R. MILNER—
Boring Block
*and*
RAY CAFIERO—
Curved-Surface Gage

### Rotary Table Grooves Tube Form

THE "MANUAL ARMBREAKER" job by Frank Zarnowski in a recent issue can be done in a much easier way if a milling machine with a rotary table is available.

The steel block for the tube-bending form can be drilled and reamed and then clamped to the table. The edge of the block can be milled straight with an end-milling cutter, using traverse or longitudinal feed, and the radius can be milled as the table rotates.

The groove around the end of the block and along the two sides can be milled with a radius cutter, following the same table feeds as were used for the end-milling cutter. This would leave little hand work to be done to clean up tool marks. *C. Taylor, Rome, N. Y.*




## Tabulated Constants for Pulleys Found with Form-Tool Mathematics

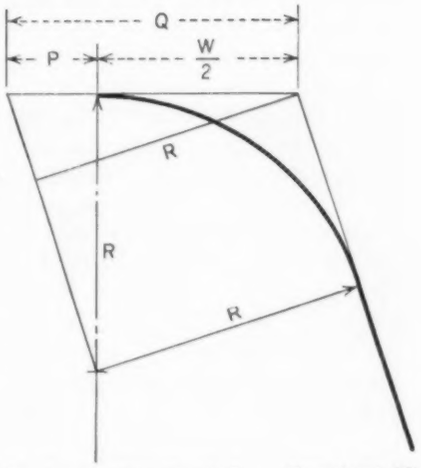
ROUNDED CORNERS are usually necessary on machine parts to reduce stress concentration, especially if the parts are heat-treated. This applies to V-belt pulleys as well as any number of other products.

To make accurate form tools to cut the pulleys we have developed a table of constants that are applied to locate the two radius centers in relation to each other. This enables us to dimension tool drawings so that roughing-out and filing are unnecessary.

For example, if dimensions R, M, and H, and the angle ø are known, the widths W $\left(\text{or}\ \frac{W}{2}\right)$ and X can be found from two formulas:

$X = HJ + YK$, where J and K are constants for the angle $\frac{\phi}{2}$.

$\frac{W}{2} = RK$, where K is the same constant as above.




| Angle ø | Constant J | Constant K |
|---|---|---|
| 26 | 0.2309 | 0.7954 |
| 27 | 0.2401 | 0.7883 |
| 28 | 0.2493 | 0.7813 |
| 29 | 0.2586 | 0.7743 |
| 30 | 0.2679 | 0.7674 |
| 31 | 0.2773 | 0.7604 |
| 32 | 0.2867 | 0.7536 |
| 33 | 0.2962 | 0.7467 |
| 34 | 0.3057 | 0.7400 |
| 35 | 0.3153 | 0.7332 |
| 36 | 0.3249 | 0.7266 |
| 37 | 0.3346 | 0.7262 |

These values are for recommended pulley angles for top widths (W) from ⅜ in. to 1 in. on standard 40° V-belt pulleys.

The proofs of the formulas illustrate how the constants can be determined for any angle. Referring to the sketches—

$$X = A + B + C$$

Let $Y = R + M$, the two radii

$$X = (H - Y)\left(\text{Tan}\ \frac{\phi}{2}\right) + \frac{R}{\text{Cos}\ \frac{\phi}{2}} + \frac{M}{\text{Cos}\ \frac{\phi}{2}}$$

$$= (H - Y)\left(\text{Tan}\ \frac{\phi}{2}\right) + \frac{Y}{\text{Cos}\ \frac{\phi}{2}}$$

$$= H\ \text{Tan}\ \frac{\phi}{2} + \frac{Y}{\text{Cos}\ \frac{\phi}{2}} - Y\left(\frac{\text{Sin}\ \frac{\phi}{2}}{\text{Cos}\ \frac{\phi}{2}}\right)$$

$$= H\ \text{Tan}\ \frac{\phi}{2} + Y\left(\frac{1 - \text{Sin}\ \frac{\phi}{2}}{\text{Cos}\ \frac{\phi}{2}}\right)$$

Thus, constant $J = \text{Tan}\ \frac{\phi}{2}$ and

$$K = \left(\frac{1 - \text{Sin}\ \frac{\phi}{2}}{\text{Cos}\ \frac{\phi}{2}}\right)$$

For length $\frac{W}{2}$,

$$Q = \frac{R}{\text{Cos}\ \frac{\phi}{2}} \quad \text{and} \quad P = R\ \text{Tan}\ \frac{\phi}{2}$$

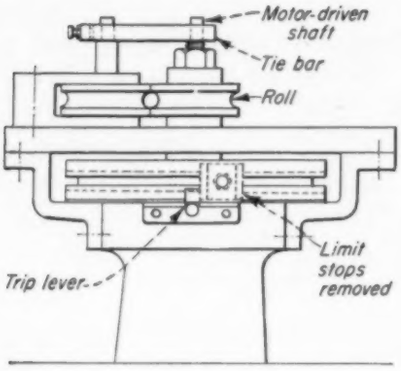
$$\frac{W}{2} = Q - P$$

$$= \frac{R}{\text{Cos}\ \frac{\phi}{2}} - R\ \text{Tan}\ \frac{\phi}{2}$$

$$= R\left(\frac{1}{\text{Cos}\ \frac{\phi}{2}} - \frac{\text{Sin}\ \frac{\phi}{2}}{\text{Cos}\ \frac{\phi}{2}}\right)$$

$$= R\left(\frac{1 - \text{Sin}\ \frac{\phi}{2}}{\text{Cos}\ \frac{\phi}{2}}\right)$$

And $\frac{W}{2} = RK$. *D. E. Sweet, Marblehead, Mass.*




## Bender Cold-Reduces Tubing

ODD-SIZE TUBING, required for a special job in large quantities, had to be made from standard tubing. The nearest larger size was ⅞-in.-dia. stock, and this was to be reduced to 55/64 in. We had no lathe available at the time, so we adapted an old tube bender for the job.

Two 6-in.-dia. rolls were made with semicircular grooves of the required tube size. These were mounted in the bender, and their shafts were held at the proper distance by a tie rod. One roll was mounted on the square shank of the machine spindle and the other was fixed on the bracket that normally carried a sliding bar.

Limit stops were removed and the machine was run constantly. Tubing was fed through continuously and the product was produced with the required diameter. *S. Framurz, Bombay, India.*

## European Punch Guides Simplify Die Making

TOOLMAKING is always based upon the same engineering principles, no matter where it is carried on, but many different practices are followed in different parts of the world, even in attaining the same goal. As a toolmaker of European extraction, I would like to describe an example of European die-making practice that is unusual to most American toolmakers.

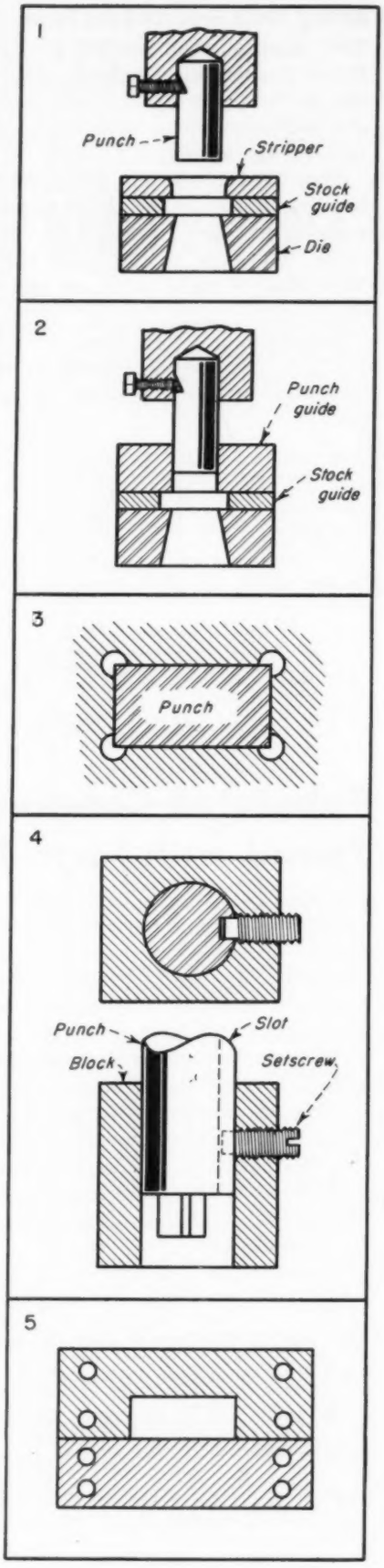
When a press is in poor alignment and the work is thin and being punched to close tolerances, an American toolmaker takes a die set—either buying one or making one himself, and he usually prefers the first solution—and mounts the die in it. Then he is sure the alignment will be perfect and independent of the conditions of the press.

The European toolmaker proceeds in another way—one that is quite simple. He substitutes a thick plate (or guide), Fig. 2, for the stripper, Fig. 1. Its thickness is a compromise between strength and workability, but is from 1 to 1½ in. for medium die work, and replaces a stripper that is about ⅜ in. thick. The clearance hole is made a sliding fit, instead of having the usual 1/64 in. clearance all around. The inside surface of the hole is often lapped, and is exactly straight and square to the surface of the plate. Advantages of economy and ease of manufacture are obvious.

With this system, I have developed a few ideas of my own. Rounded corners at the edges of the hole are an advantage in entering the punch into the hole, so I file these edges. The punch need not bear on the inside surfaces of the guide all around to produce the required results, so I start the guide hole in fabricating by drilling holes at four corners and leave these holes free, Fig. 3.

Round holes are easily drilled and reamed, and round punches are simple jobs on the lathe. Fits are easier to control if the punch-block is a cylinder with the actual punch mounted on its lower end, Fig. 4. A slot is usually made lengthwise in the punch-block and a large setscrew is driven in from the side of the guide. This controls rotational position and keeps the punch aligned.

Just as dies are sometimes made in sections, the guides can be made in two parts. This is a considerable advantage when the guide is rectangular. One part of the guide is milled or shaped flat, and a channel is machined in the other. This not only saves work, but invariably makes accuracy greater. *Federico Strasser, Santiago de Chile.*



# NEWS OF METALWORKING

## ECA Spending for Machine Tools Set at $56 Million by July, 1949

WASHINGTON — Marshall Plan countries expect to spend 56-million ECA dollars on U.S. machine tools this fiscal year (July 1, 1948 through June 30, 1949). Most of these orders are yet to come—during January-June period.

The main reason machine tool industry has not received much ECA business is that over half the industrial machinery procurement authorizations issued through Oct. 15 were in the form of reimbursements for items already ought outside of ECA.

Another $50 million in procurement authorizations just now being processed, all for the United Kingdom, is entirely made up of reimbursements rather than money for new orders. Of the U.K. figure, $30 million for machine tools, and $800,000 for metalworking machinery. All of this was bought outside ECA channels either before or during the first three-quarters of ECA's existence.

The reimbursement problem in deciding the significance of procurement authorizations is scheduled to disappear after this month, however. The deadline on which participating countries would apply for reimbursements was Nov. 1. The last of them are being processed now.

There has been some talk that ECA is financing a lot of purchases from War Assets Administration. The fact is that for industrial machinery and equipment, ECA has actually financed only one such purchase—that was $1.4 million ($2.8 million original value) worth of coal-mining and electrical equipment for Bizonia. There are some European countries who buy direct from the War Assets Administration on their long-term credits with the agency, but no ECA money ever appears here.

Another reason the machine tool industry has not received many ECA orders is that at the start, Marshall Plan countries wanted to rehabilitate their industries as fast as possible, therefore they bought finished machinery rather than machine tools. Forecast from now on is a steady increase in ECA dollars for machine tools and metal working machinery as the rebuilding of industrial plants increases.

***WELDED FITTINGS** were produced from flat steel plates at the Akweld Construction Co., Brooklyn, N. Y., when a lighting company had difficulty in obtaining the desired cast iron welded fittings. They ranged in diameter from 8 to 50 ins. Air Reduction Sales Co. engineers aided in the work*

### $36 Million Approved

WASHINGTON — ECA has taken a $36-million bite out of hard-to-get industrial machinery. Procurement authorizations for week-ending Oct. 27 included $5,281,200 worth of U.S. machine tools and metalworking machinery, three-quarters scheduled for France.

Some items to be bought under authorizations are lathes, milling, drilling and grinding machines, shaper, honing machine, and cut-off machine.

Construction, mining, and oil-well drilling, refining, and storage equipment accounted for $4-million, and included excavating, earth-moving, rock-drilling, and concrete equipment, plus saws, drills, mine cars and locomotives, shovels, loaders, excavators, graders.

For the same week, special and general industrial machinery other than the above cost the American taxpayer $18,872,000. Included were industrial tractors, boiler accessories, soot-blowing equipment, condensers, refrigerators, industrial, hand tools (except power, $1-million worth), office machinery, high-capacity veneer drying machine, spindles, bearings and drives for textile machinery, ball bearings, accessories for gas plant coke furnace, and machinery for textile, chemical, paper, glass, ceramic, building material, and woodworking plants.

Electrical equipment accounted for $3,824,100 and another $10-million was authorized for railroad equipment.

### Allegheny-Ludlum Plants Mark 50th Anniversaries

Two plants of the Allegheny-Ludlum Corp.—those at West Leechburg, Pa., and Dunkirk, N. Y.—celebrated their 50th anniversaries during the week of Oct. 18. Both were celebrated with open houses for families of workers and workers and office personnel acted as guides. Town officials and merchants cooperated by designating one day as a legal holiday and providing special services to assist. The attendance in both cases exceeded expectations.

# Metal Show Proves Valuable to Exhibitors

PHILADELPHIA — Honoring the 75th anniversary of the development of alloy steels, the 30th National Metal Congress and Exposition, better known as The Metal Show, was held in the Commercial Museum & Convention Halls Oct. 23 to 29.

Exhibitors, generally, expressed themselves as well satisfied with the attendance and the interest displayed. Inquiries were numerous and were at a level to indicate a reasonable prospect of subsequent action.

More than 300 companies exhibited a wide variety of products and processes, of which the most outstanding new developments are described briefly herewith.

*BUICK engineers O. N. Peterson and H. H. Miller (left) are interested spectators at the Cincinnati exhibit where overrunning clutch parts for the Dynaflow are flame hardened on a Flamatic machine*

## NEW WELDING TECHNIQUE

Two completely new developments in the arc welding field were shown by Air Reduction and Linde Air, respectively. In the Airco process a pistol-type welding gun is employed, and aluminum wire is fed mechanically and automatically through the barrel from a coil on the control box. Known as the Aircomatic Process, it is a development of the inert-gas-shielded arc welding process and reduces the operation of welding to a form so simple that virtually no training is needed. Wire feed ranges from 100 to 300 ipm. with extremely high current densities. The gun can be used in any position, and welds are clean, free from spatter, and show excellent penetration. To weld, the trigger of the gun is depressed, starting a flow of argon to purge the lines. The projecting end of the wire is then scratched on the work to establish an arc, and at the same time the feed controls operate to deliver the filler wire. The operator then merely guides the gun over the work, holding it at a constant distance above the surface.

The Linde innovation consisted of an inert-gas-shielded arc spot welder a completely new departure for the Heliarc process. The unit consists of a small plastic pistol about the size and shape of a Colt "45" automatic. To produce a weld, the muzzle is placed at the desired point, the trigger pressed, and the gun held in place for a few seconds until the arc is extinguished. No forging pressure is required and no backup is necessary. It is thus possible to produce spot welds from only one side of the work and to reach areas entirely inaccessible for the conventional spot welder. Weighing only a few ounces, the gun is so completely flexible that if the work surface can be touched with a finger tip it can be spot welded.

The gun is equipped with a water-cooled copper cup at the muzzle, from the center of which the tungsten electrode projects, toward but not touching, the work. When the trigger is pressed, argon flows into the cup, surrounding the electrode and work with a protective atmosphere and escapes through notches in the rim of the cup. High-frequency current ionizes a path between electrode and work and allows the welding current to initiate an arc to produce a weld. A mechanical or electronic timer controls weld time and allows for an after flow of gas to cool the electrode.

The arc is confined primarily within the cup, so only flash glasses or plastic face shields are required. There is no spatter, toxic fumes or smoke. A single 25-ft. cable, entering the gun butt, carries welding current, cooling water, argon gas and the trigger control.

Other Linde exhibits included the high-speed cutting of stainless steel with powder injection, and roll buildup with Unionmelt welding.

## WELDING EQUIPMENT

A surprising amount of welding apparatus was on display, among which was noted Lincoln Electric's equipment for manual hidden-arc welding, and Harnischfeger Corp.'s new 300 amp. dc motor-generator set and attractive display of transformers and generator sets in transparent plastic housings designed to reveal the interior arrangements.

Hobart Bros. Co. exhibited a full line of arc welders, electrodes and accessories, including a 200-300 amp. gasoline engine driven combination ac arc welder and ac power unit for welding or emergency power purposes. A 300-500 amp. inert-gas-shielded arc welder was also shown. This unit is designed expressly for Heliarc welding and incorporates a single foot switch for control of gas, water and welding current. For use with a standard ac transformer, a special Heliarc attachment was shown. This is intended to permit the owner of standard equipment to use Heliarc without the expense of purchasing a separate welder.

Westinghouse displayed a complete line of electrodes, welders and transformers, together with its submerged-arc dc welder. The Westinghouse Weldomatic was demonstrated at the Stoody Co. booth in connection with Stoody hard-facing alloys in coils for automatic application.

In addition to its regular line of equipment Arcos Corp. had on display the new Magnetrode Magnetic ground clamp. Produced by Vanol Corp., St. Louis, this unit clamps firmly to any ferrous metals through

the action of powerful magnets. It is built in two models for manual work and a special type for automatic welding in which the cable is attached by a full swiveling coupling.

## PRECISION MACHINES, INSTRUMENTS

George Scherr Co., Inc. exhibited a complete range of precision measuring instruments, including the Parkson gear testers and the Chesterman height gages, the latter available in heights up to 48 in. These are imported from England and are now obtainable in several new types. The Belgian-made Cornelis thread generating machine was also announced. This machine cuts threads on long shafts such as leadscrews and other precision work, and has the advantage that the thread may be cut after keyways have been milled, without producing burrs. The machine can also be equipped with special formed cutters for producing a wide variety of shaped work.

Several new instruments were exhibited by Physicists Research Co., including a rotary piloting fixture to provide the tracing motion necessary for making Profilometer measurements around internal and external surfaces of rotation. This is particularly adaptable to ball and roller bearing races. Also shown by the same company was the Proficorder, a mechanical-electronic instrument to provide a magnified chart record off the true profile of a machined surface. It is designed particularly to show waviness bows, steps and other irregularities spaced at over 1/32 in. Special piloters are available for covering remote areas of large sheets and for gaging cylinder bores.

Tinius Olsen had several types of universal, torsion and stiffness testers on display, including the recently developed Electromatic testing machine. Developed originally for research work, it serves equally well for quality control and production testing. It can be used for obtaining accurate physical properties of materials that defy testing in ordinary low-capacity machines.

Baldwin Locomotive Works featured a new SR-4 Load Cell for translating changes in weight into electrical energy. Utilizing the SR-4 strain gage in a sealed unit, the instrument may be employed for weighing tanks and similar items, or may be made into a tension link. Also shown was the Tate-Emery air cell for inserting in the grip slot of a testing machine to extend the precision range downward to a very small load value. By its use it is possible to employ a 120,000 lb. testing machine for testing light materials such as threads, foils and filaments.

*AIRCOMATIC welding gun introduced by Air Reduction Sales Co. welds aluminum in any position with an inert-gas-shielded arc and electrode wire fed automatically from a coil*

*SPOT WELDING gun developed by Linde requires no backing up and no forging pressure. Using a tungsten electrode and an inert gas shield it spot welds steel by simple application to one side of the work*

## HEAT TREAT EQUIPMENT

Cincinnati Milling Machine Co. attracted wide interest with its display of Flamatic selective flame hardening machines. Two of these were in continuous operation, performing actual production jobs, one hardening the internal cam lobes of a Buick Dynaflow clutch part, the other operating on the spline and pilot ends of a gear reducer driveshaft for Rockford Clutch Div., Borg-Warner Corp. Production on the Buick part is 187 per hr., and on the spline shafts 200 per hr. Temperature is controlled within ±5°; heating is absolutely uniform and distortion is neglible.

Introduction of an electronic induction heating unit by Lindberg Engineering Co. marks a new entry in this field. The unit is compact, and features a regulating circuit to automatically control the output power during the heating cycle.

# Ford Reveals Work on Hydraulic Transmissions at Gear Meeting

CHICAGO—Some 250 people attended the 1948 Semi-Annual meeting of the American Gear Manufacturers Assn. at the Edgewater Beach Hotel here Oct. 25-27. A feature of the sessions was a 2-part symposium on gear finishing, with three experts discussing gear shaving one day and three gear grinding the next. Two other technical papers were presented, "High-Speed Industrial Gear Drives" by C. B. Connell of Westinghouse, and "Torque Converters" by John Swift of Ford, the latter being the first public admission that Ford had been working with hydraulic transmissions.

In opening the first general session, Pres. W. L. Schneider (Falk Corp.) pointed out that many gear shops have a large amount of standby equipment for special jobs—and investment necessary to operation but not particularly productive of profit. Further, the difference in acquisition and replacement costs of all equipment will become very important when volume shrinks, causing a radical reduction in profit margins unless adequate reserves are built up.

**Three Members Accepted**

The Association now has 162 members, having accepted three academic members and one company resignation since the last report in June.

Henry Fowler of the Chamber of Commerce of the U. S. spoke at the initial session on the present price situation and possible implications of the Supreme Court decision in the cement case. He pointed out that pricing policies are sometimes right in the beginning, sometimes right in the end—and sometimes right in the middle.

A. G. Bryant, president of the NMTBA, presented his opinion of the European situation (*AM*, Sept. 23, page 141) at the luncheon meeting.

Many committees of the Association met during the convention. In open gearing, rim, supporting-member and hub weights are to be charted so engineers can estimate rough-casting weights for steel gears of 12 to 60-in. O.D. and 1½ to 6-in. D.P. A revision of the standard on nomenclature and definitions is practically complete and will incorporate a short list of abbreviations. Other standards in process include one on clearances for fine-pitch gears, one on straight bevel gears, one on hobs, and one on fine-pitch hobs. Revisions are in process on several others: Tooth form for straight and helical gears (206.02) will include 7-, 8- and 9-tooth special pinions. Surface finish data will be added to the inspection standard (236.02). Inspection practice on worms and wormwheels is being prepared. Design and rating of fine-pitch gears (374.01) is practically complete. The straight bevel-gear system involving the 14½° pressure angle will be superseded by one involving a 20° pressure angle, except where undercuts are a problem. Other projects in process include standards on bolting, sleeve bearings and small marine speed-reducer units.

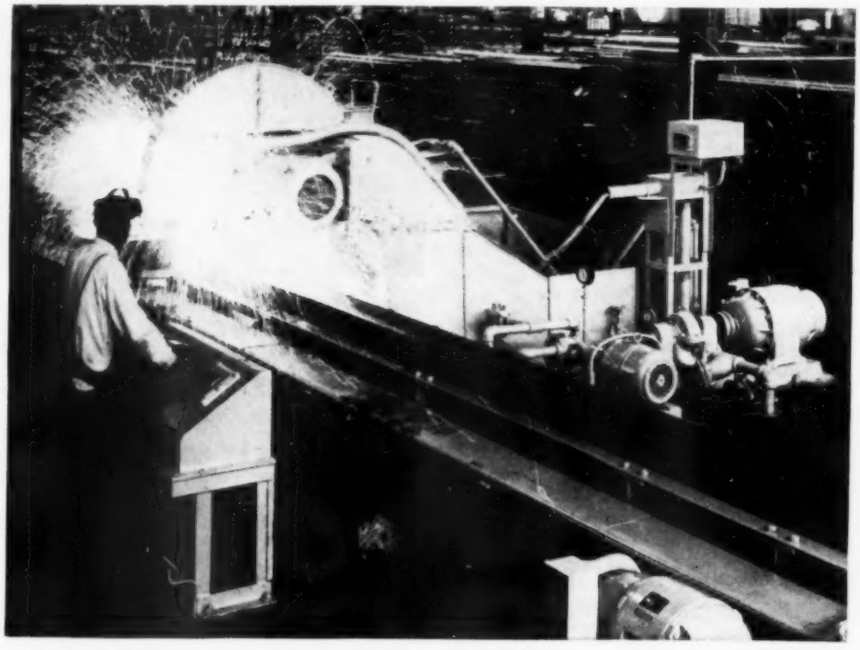
**First Section In Process**

The first section of the new service manual is now in process, and the first draft is completed on lubrication practice with mild-E.P. lubricants on industrial gearing. Data sheets are being developed on lapping compounds for gears, on greases for industrial gearing, and on coolants. Data sheets are also being prepared on hob sharpening and on the effects of errors in hobs.

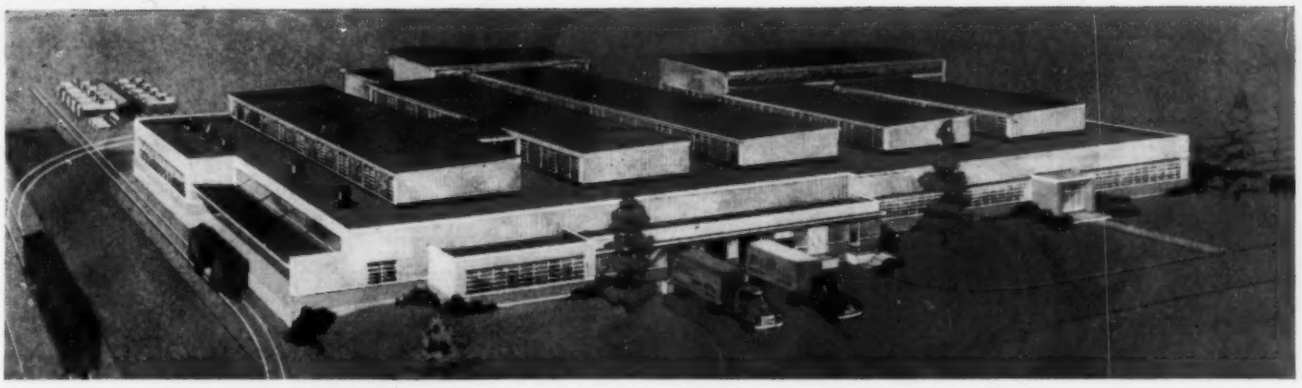
C. B. Connell described design and production of Westinghouse's high-speed industrial gear drives. His paper was in general a survey of the problems involved, concerned particularly with design and with results of some tests conducted by his company. John F. Swift explained in his paper that the torque converter is one type of hydrodynamic transmission, meaning specifically the type which operates through dynamic flow of fluids. He pointed out that physically these transmissions are simple as to parts, but difficult to analyze. He showed how one basic design may yield various results with one engine when combined in different sizes and how some gearing combinations affect over-all performance, as do the torque characteristics of the engine under test. It is apparently advisable to use mechanical gearing with a hydrodynamic transmission. Hence, these units will broaden rather than reduce the field.

**Gear Shaving Discussed**

L. J. Collins of General Electric, West Lynn Works, acted as moderator for both sessions on gear finishing. In the session on shaving, Louis D. Martin of Eastman Kodak discussed the shaving of fine-pitched gears. Ben Bregi of National Broach talked on medium-sized gears particularly for automotive service, and George B. Maurer of Falk Corporation discussed applications on large-size gearing. Abstracts of these papers will appear in later issues. In the grinding portion of the symposium, fine-pitch gears were discussed by A. S. Beam of Vinco Tool, aircraft gears by D. W. Dudley of General Electric, while G. L. Dannehower described the Maag principle of gear grinding. Their papers in general amplified the principles brought out in the recent article by L. P. Tarasov (*AM.*, Sept. 9 and 23). In discussion, T. R. Zimmer of Detroit Gear Grinding pointed out that work-traverse and spindle speeds, as well as wheel selection, are vital. He described one case in which a case-hardened pinion developed cracks when ground at the spindle speed of 3200, but was produced at a speed of 2800 rpm.



***FRICTION SAWING** a structural section in the Chicago warehouse of U.S. Steel Supply Co. New high-speed saw is regarded as most modern of its type*



***MODERN SELF-CONTAINED PLANT** is being erected on the grounds of the Cincinnati Milling Machine Co. for their Cimcool cutting fluid division with facilities for efficient customer service. The latest methods and equipment will be employed to handle raw materials. The plant is shown in a photograph of the architect's sketch*

# Communism, Inflation, Labor Strife Worry of Employees, SAW Is Told

NEW YORK—Communism, inflation and the struggle between management and labor are the three top worries of employees and public alike, a recent General Electric Co. survey revealed, Charles E. Wilson, president of the company, told a session of the 2nd annual management exposition and conference of the Society for the Advancement of Management.

The three-day conference at the Pennsylvania Hotel from Oct. 28-30 attracted more than 700 executives.

Mr. Wilson pointed out the GE stock bonus plan for employee purchasers of U.S. Savings Bonds bought through salary deductions as a specific anti-inflation practice.

Warning that "we are faced with a bloodless war of ideology" and that America's entire economic concept is under fire not only abroad but at home, Thomas Roy Jones, president of the American Type Founders, Inc., urged that industry recognize two great tasks:

It must operate business in the interests of the public.

It must tell its story and tell it convincingly because "every customer, stockholder, employee and every member of the public must understand that industry is a cooperative effort and that our whole way of life depends upon it."

Nine requirements for a successful training program were laid down by John E. Gagnon, manpower manager of Bigelow-Sanford Carpet Co.:

1) Establish the need of training; 2) determine the objectives of the program; 3) determine the proper method; 4) sell the program to management; 5) develope the program; 6) train the people who are to do the training; 7) schedule the training; 8) follow-up, and 9) evaluate results.

In a special citation, Under Secretary of the Treasury Edward H. Foley, Jr., acting for Secretary John W. Snyder, presented the United States Treasury Distinguished Service Award "for leadership in building security for the people and the nation through United States Savings Bonds" to Charles C. James, national president of the SAW in recognition of the leadership of industry in supporting bond sales drives.

At another session awards were presented in absentia to Henry Ford, 2d., and to Lee S. Whitson. The Taylor Key was awarded to Dexter S. Kimball, while honorary citations were read commending the work of Prof. F. J. Roethlisberger of the Graduate School of Business Administration, Harvard University; Alexander R. Heron, vice president, Crown Zellerbach Corp.; Alvin E. Dodd, honorary president, American Management Association, and E. Wight Baake, director, Labor and Management Center, Yale University.

## Australian Steel Works Plan Expansion Programs

Long-range expansion plans of the Australian steel industry includes an $18-million program at the works at Port Kembla, New South Wales, which will be completed by 1955.

The completed program is designed to increase sheet steel production by 360,000 tons a year. Total production of sheet steel in Australia is now 240,000 tons yearly. Establishment of a completely integrated steel plant in Whyalla, South Australia, and new mills at the company's steel works at Newcastle, New South Wales to meet the demand for pipe and wire, are also under study.

Other plants are also studying expansion programs.

### Materials Handling Show

PHILADELPHIA—The Third National Materials Handling Exposition here Jan. 10-14 is expected to overshadow previous expositions in both attendance and the number of exhibitors.

Exhibits will be open at Convention Hall from 10 a.m. to 5:30 p.m. daily. A conference on materials handling will be held concurrently by the American Society of Mechanical Engineers.

# Fisher To Move To Steel Area

DETROIT—Plans for two new plants in the Pittsburgh area have been announced by the Fisher Body Division, General Motors, to bring facilities closer to the steel supply.

A war surplus plant at Ambridge, Pa., has been leased from the Navy for one unit, while a site for construction of a new stamping plant has been acquired southeast of Pittsburgh in Mifflin Township on Camden Hill Road. The Ambridge installation will be what is known as the blanking plant—for cutting sheet or coiled steel to approximate size required for subsequent stamping operations. The new stamping plant will fabricate body parts for shipment to various Fisher plants.

J. J. Cronin, general manager of Fisher Body, said:

"We always have obtained a considerable portion of our steel for Fisher production from the Pittsburgh area. So we believe it will be to the mutual advantage of ourselves and the steel companies to have a blanking and stamping plant situated at Pittsburgh. The location will accelerate delivery of steel and also the return of scrap to these mills."

# Detroit

***October Output Hits Postwar High . . . Aircooled Motor Pushed by Military . . . New Models Rushed***

**Detroit is chuckling** over a cousinly dispute going on between the Cadillac and Oldsmobile Divisions of General Motors Corp. over their new powerplants, both being installed in 1949 models.

Oldsmobile held a press showing of its engine last Sept. 15, announcing it at that time as the "Kettering engine", of a design intended for high-compression ratios, held down for the time being—due to lack of higher octane gasoline—to a ratio of 7.25 to 1.

Cadillac people began to wriggle unhappily when the resultant publicity of this press showing appeared. Its position was that the Olds engine was actually based on Cadillac designs started into development before the war.

When Cadillac showed its own new powerplant, late in October, there was no official mention of either "Kettering designs" or the Olds engine. But the Cadillac people made it plain, with elaborate nonchalance, that the prototypes of its 7.5-to-1 ratio job had been first started in the late 30's.

Cadillac made it plain by its announcement timing, too, that it wanted to get into a publicity swim which it apparently felt was being thinned out for it by the Olds announcement move. The Cadillac engine was shown to distributors and the press weeks before the 1948 models with the older type of engine went out of production, and a good six weeks or so before those 1949 engines would ever get into showrooms. Quite obviously Cadillac wanted to put across its long-term development story on the new engine before any other untoward—from its viewpoint—event occurred.

***NEWEST NAVY CARRIER AIRPLANE,*** *North American Aviation XAJ-1 has successfully completed its initial flight at Los Angeles. Faster and able to carry heavier bomb load than present carrier types, XAJ-1 is powered by two Pratt & Whitney Double Wasp reciprocating engines under wings and one General Electric-Allison turbo jet engine in tail of fuselage. Turbo jet engine can be cut in for added speed under combat conditions. Plane will carry crew of three in pressurized cockpit.*

#### New Models Rushed

Elsewhere in General Motors there is some mild unhappiness over the fact that the corporation has scheduled its gala 1949-model showing in New York during the last fortnight of January. Both Chevrolet and Pontiac will be hard pressed to make that showing date; it is quite possible there will be no production in either division on 1949's by that time. The same holds even more true for the Buick Special series, which will presumably come in part off some of the Chevrolet-Pontiac dies—the Buick Special will not be in dealer showrooms before March.

Unhappiness over new models is hardly confined to General Motors. Chrysler is sweating hard to translate its finally approved designs into tooling in time to make reasonably early dates next year. There is some conversation that the various Chrysler divisions will soon be given a little autonomy on their own design work, but there hardly appears much basis for such reports as long as the corporation engineering continues to be one center on Massachusetts Avenue.

#### Some Notes of Happiness

There are some notes of happiness also. Take, for example, one of the better-known automobile engineering laboratories. Its technicians think that they are on the edge of the nearly ideal transmission—one that combines the best attributes of the G.M. Hydra-matic and the Buick Dynaflow torque converter — one that not only combines these attributes, but also provides the economy of synchronous mesh gear train. This particular transmission probably has a year or more of testing ahead of it before any move is made to put it into production. It may appear on 1951 models.

Happiness, too, reigns at Continental Motors Corp., where its long-term development work on a line of aircooled engines, recently announced, is now culminated in a $28-million military order. This happiness is reflected in the hearts of tool and machinery companies which began to converge on the company as soon as the announcement was made —because about $9.7 million of the total order is specified for equipment.

On this score, note should be taken of the fact that the services have quietly designated General Motors Corp. to get busy on a parallel line of aircooled engines in the power range's low end where Continental's series leaves off—from 125 hp. down. The product development section of General Motors is looking into the program now.

An aircooled engine of worthwhile operating characteristics in the range up to 125 hp. has some definitely significant implications. The most notable of them is the fact that this would be an ideally-sized power plant for use in automobile vehicles. Maybe the high-compression jobs now tooled in Cadillac and Olds will be superseded ultimately by the aircooled units.

#### October Record Set

There is some happiness, too, to be reported in the fact of automobile production. During October, the preliminary figures now show, output ran to approximately 506,000 cars and trucks in all U.S. and Canadian plants. This was the best postwar total, the highest since the middle of 1941.

Early November saw a mild slump due to short-term shutdowns for inventory at Ford and for changeovers at Cadillac and Buick. By mid-month, however, the total was expected to be advancing again toward the range between 115,000 and 120,000 units a week. With sustained production expected at most points for the rest of the month, November's output should come close to October's.

# Motor Transport Exhibit Reveals British Progress

LONDON—(McGraw-Hill WORLD NEWS)—The 14th International Commercial Motor Transport Exhibition in London in October spotlighted Britain's post-war progress as a maker of heavy vehicles. All told, half a million trucks, buses and utility vehicles have come off British assembly lines since the War—110,206 of them during the first eight months of 1948. And whereas only 15% of British-made commercial vehicles were exported before the war, 50% are being shipped abroad now. Most of them range from 1-ton to 6-ton carrying capacity.

Fewer foreign firms exhibited at the show this year than usual, and neat "For exhibition only" signs marked the foreign-made models that were given special import licenses for the occasion. They included three Panhard & Levassor vehicles from France, and American-made Chevrolet, Studebaker and Dodge trucks.

**Foreign Buying Heavy**

Although accounting for only a small percentage of the total 130,000 visitors to the Exhibition, overseas buyers placed almost $80 million worth of orders during the eight days—or four-fifths of the total value of deals closed at the show. Many foreign buyers stayed on in London through Nov. 6th to visit the 33rd International Motor Exhibition. Typical large purchases made at the show: an Indian Army contract to buy $1 million worth of trucks and spare parts, an Argentine deal for 146 British-made trailers of varying tonnages, and another Argentine contract for 59 luxury diesel-engine buses costing more than $1 million.

In all, 47 exhibitors displayed some 450 different types of vehicles, including trucks and vans ranging from 5-cwt. to 22-ton capacity, coaches and omnibuses, trolley and electric vehicles, tractors, ambulances, and municipal and public utility vehicles. The wide variety of mobile units included vehicles especially equipped as moving picture houses, industrial canteens, rural vegetable shops, and hospital-ambulances.

**Streamlining Stressed**

Immediately after the war, the British motor industry decided to continue with pre-war designs in order to achieve volume production without loss of time for re-tooling. Now, however, many of the new products have a decidedly American appearance. Streamlining is particularly noticeable in the newer buses now on the market.

***SHINING ARMOR** of magnesium reduced the weight "knights" had to carry around in a recent film. Ancient battle suits weighed well over 100 lbs. whereas the modern reproductions weigh only 30 lbs. The adjustable suits were made by the Arrowsmith Tool & Die Co., Los Angeles, plane parts fabricators*

# Eight Pressing Problems Facing Production Men, AMA Survey Finds

NEW YORK—A survey of 1,000 companies throughout the nation showed the eight most pressing problems currently confronting production executives in their attempt to lower costs and increase output and quality, according to the American Management Association, are:

1. Insufficient employee interest in increased production.
2. Inability to meet customer deliveries because of uncertainty of deliveries from suppliers.
3. Maintenance inefficiency causing time lost for repairs.
4. Less than maximum effectiveness in physical handling of materials in the manufacturing process.
5. Inadequate leadership by foremen and supervisors.
6. Lack of sufficiently close coordination between production engineering and sales.
7. Inadequate inventory controls in scheduling full use of equipment for plants producing a wide variety of products.
8. Interruptions of production where design changes rapidly.

Almost every response to the survey indicated company concern about a lack of employee interest in increased production, the AMA said. Several companies reported an indifference by employees even to opportunities to earn higher pay on incentive plans rewarding greater than standard output.

The survey was undertaken by the Production Division of AMA to determine topics for discussion at a two-day meeting in Chicago Nov. 18 and 19, at which executives from more than 800 companies from all parts of the country and major industries will confer.

The conference, under the direction of George S. Dively, AMA production vice president and president, Harris-Seybold Company, Cleveland, will direct its attention to four main considerations which cover the production problem reported to AMA:

1. Production planning 2. Building worker interest in production problems 3. Coordination of factors affecting production 4. Improving the supervisory level of management.

## Car Delivery Practices Studied by House Group

WASHINGTON—A quiet but searching investigation of new car delivery practices in metropolitan Washington, D. C., by a House subcommittee checking questionable trade practices, may lead to an open congressional hearing soon.

Committee investigators have found new cars, not previously titled or registered, on used-car lots and are attempting to trace sources.

Passenger car producers have been asked for lists of serial numbers of all vehicles shipped into the area so far this year. Just what the committee will prove to be illegal here is not known.

# U. S. Units Open Probes of Auto Parts Handling

WASHINGTON—A two-pronged attack on the "exclusive dealer" and the "genuine parts" practices by several of the large producer-retailer corporations has been launched in Washington.

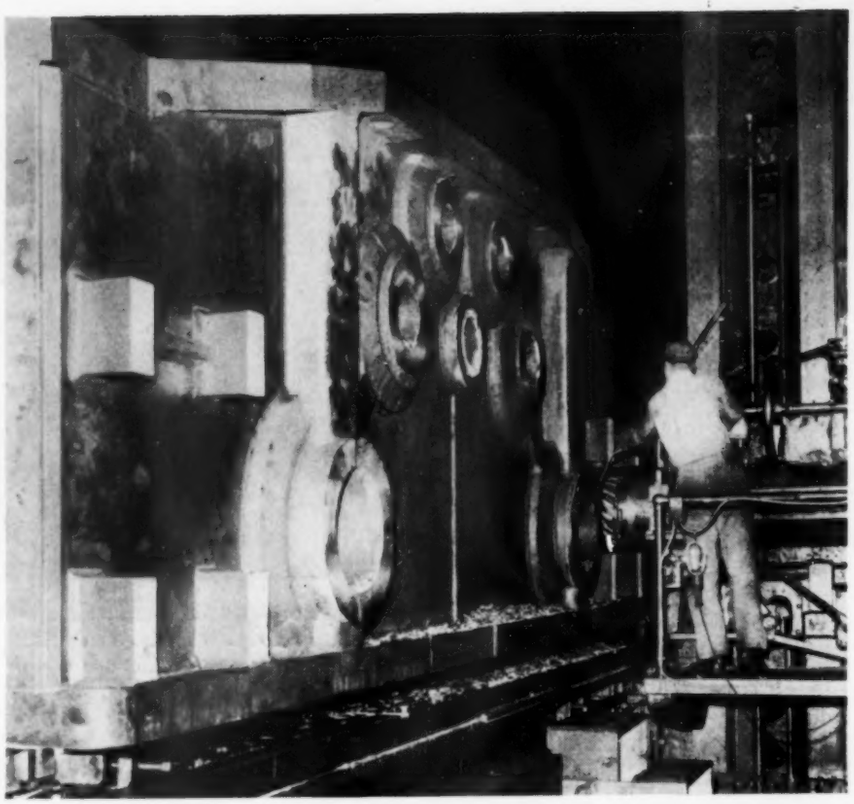
Just gaining momentum is the House small business committee's investigation into complaints by mid-western tire, parts and gasoline dealers that the rubber, oil and auto manufacturers were forcing dealers to handle "genuine" parts and accessories exclusively. This means exclusion of independent lines of merchandise. Some of the dealers testifying before the groups stated they were threatened with loss of their franchise if they did not exclude the independent lines of merchandise. This could be considered an anti-trust practice, or restraint of trade, committee members said.

The Justice Department, meanwhile, has launched criminal prosecution of several large corporations for "exclusive dealer" contractual practices, which it claims is a violation of the Sherman Anti-Trust Act.

First to be attacked on the "exclusive dealer" operation was Standard Oil Co. of California. In this case the Department of Justice obtained a Federal District Court ruling that the practice is an Anti-Trust violation. The Court ruling has been appealed.

Civil suits charging violations of both the Sherman and Clayton Acts have also been brought against the principal farm equipment manufacturers. The Justice Department is seeking injunctions which would terminate written or oral contracts between manufacturers and dealers which confine the dealer to handling only one manufacturer's line of product. The suit also would prohibit manufacturers from refusing to sell to a dealer who handled the products of more than one producer.

The intent in outlawing the exclusive dealer practice, according to the Justice Department, is to restore competition to the market, to the benefit of dealers, farmers, and manufacturers, and to allow dealers to handle more than one line.



***FORTY-EIGHT TON** press crown section undergoes a series of milling and facing operations in one setup of a large mill at Salem, Ohio, plant of E. W. Bliss Co. Press will deliver 2000 tons pressure at bottom stroke*

# Heavily Tooled Plants Turning Out Prefab Houses

WASHINGTON — Prefabrication is more an influence than a physical factor in house production. Of 950,000 dwelling units being completed this year, only about 40,000 come out of the plants of recognized prefab manufacturers. This 5% contribution could be disregarded except for one thing: it keeps alive a concept that will gain strength as price resistance of home buyers increases.

Actually, prefabricated housing is a bigger factor in the 1948 supply than the 40,000-950,000 ratio would indicate. It's a safe guess that 100,000 of the 950,000 units being completed this year are in multiple-dwelling structures that cannot use the products of prefab factories. The prefab manufacturers concentrate almost exclusively on detached single houses, one-story or one-and-one-half.

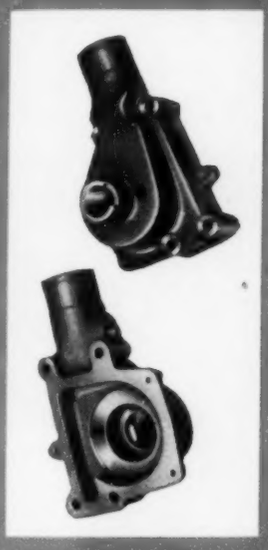
Because the word prefabrication has become a rubber blanket, some recent entries into the prefab field have coined a new one—the machine-made house. These manufacturers regard themselves as the real exponents of mass production for houses. Their production technique calls for heavily tooled, expensive plants to turn out fabricated parts—manufactured to interchangeable precision and packaged for quick, complete assembly on a prepared foundation. All prefab manufacturers utilize industrial production methods for their factory operations.

Machinery does the work: Total man-hours for a house—in the plant and at the site—are low. The newer producers in their public statements have particularly emphasized this great saving in labor. A number of the newcomers work with metals.

Their problems—in more exaggerated form—are the same as those that plague the older prefabricators: money and merchandising. The seasoned prefabbers are less willing than they were in the '30's to turn out engineered houses that stray too far from traditional designs—at least so far as appearance is concerned. Their market, they feel, is not ready to accept any large number of houses that look unusual—no matter how well designed for economy, livability and pleasing appearance.

In a buyers' market, this inertia—if it still envelops the home seeker—would be a major block to the machine-made house that uses unconventional materials for walls, roof and ceilings. The present unsatisfied demand for homes postpones the problem. Producers of machine-made metal houses today ask only for steel and aluminum to fill their orders. They get only dribbles of these scarce metals. The recent six-month steel allocation (59,000 tons total) to six house manufacturers permits production at only one-third of capacity for that period.

*Another Special Machine by Cross*



# Double Loading *Skyrockets* Water Pump Production

With each cycle of the machine illustrated above, the operator loads a new water pump body at the first work position and transfers a semi-finished part from the first to the second position. Thus, the water pump is finished completely (except for precision facing the seal face) *with one machine and one operator.* Production is stepped up materially because second operation work is completed simultaneously with the first chucking.

Specially designed for water pump bodies, this new Cross machine is nevertheless extremely flexible because it is made up of standard Cross sub-assemblies which can be regrouped into various combinations for producing many different parts. It is another example of the fact that "It Pays to Consult Cross to Cut Costs."

**PART:** Water Pump Body.

**OPERATION:** Machine complete except for precision facing seal face.

**PRODUCTION:** 90 pieces per hour.

**EQUIPMENT:** Cross Six-Station Combination Milling, Drilling, Boring, Reaming and Tapping Machine.

**FEATURES:** Six-station power operated index table ☆ Two station work holding fixtures for handling operations on opposite ends of part ☆ Separate loading station permits parts to be loaded while machine is cutting ☆ Ten parts machined at one time progressively in five working stations ☆ Flexibility for part design changes through use of standard Cross way-type units, column and index table ☆ Hydraulic feeds for milling, drilling, boring and reaming ☆ Individual lead screw feed for tapping ☆ Hardened and ground steel ways ☆ Automatic push button controlled work cycle.

*Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.*

THE **CROSS** COMPANY

*Established 1898*

**SPECIAL MACHINE TOOLS**

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

# INSPECTOR'S DIAL BENCH GAGE NO. 654

Among the many outstanding applications of Starrett Dial Indicators to quality control procedures, Starrett No. 654 Dial Bench Gage offers many advantages. The adjustable table and lateral and fine perpendicular adjustment of the sliding head provides the flexibility needed for rapid adaptability to a wide range of applications.

Any style of indicator can be furnished. When equipped with Starrett Indicator No. 25-T5 (0-5-0, reading .0001") fitted with tell-tale hand and top lift lever, the maximum in speed, accuracy and convenience is provided for taking close measurements on a series of work pieces. Starrett No. 25-T1 is another popular indicator widely used for this application.

For a complete description of Starrett Dial Bench Gage No. 654 and the many Starrett Dial Indicators for quality control, see Starrett Dial Indicator Catalog C. Write for a copy.

**Starrett No. 25-T-1 Dial Indicator**

Reads 0-5-0 by ten-thousandths, range .025. Can be furnished with tolerance hands to show plus and minus limits.

**Starrett No. 25-T5 Dial Indicator**

A long range indicator reading 050, graduated .001", range .200", with double dial and tell-tale hand.

TRADE MARK
Starrett
REG. U. S. PAT. OFF.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • HACKSAWS AND BAND SAWS • PRECISION GROUND FLAT STOCK
*Buy Through Your Distributor*

**THE L. S. STARRETT CO.** • *World's Greatest Toolmakers* • **ATHOL, MASSACHUSETTS, U.S.A.**

# Copper-Alloy Arc-Welding Electrodes

COPPER-ALLOY arc-welding electrodes are now being used for fabrication of copper and copper-alloy weldments, in addition to the older applications, such as: repair welding of cast iron, welding of dissimilar metals, and depositing overlays for bearings and for wear and corrosion resistance. In recognition of the growing use of such electrodes in manufacturing, the Committee on Filler Metal (jointly sponsored by the A.S.T.M. and the A.W.S.) has developed "Tentative Specifications for Copper and Copper-Alloy Metal Arc-Welding Electrodes."

Data presented herewith are confined to chemical specifications, physical properties and notes on the use of the five groups of electrodes. Persons desiring information on testing procedures should obtain a copy of the specifications from either sponsor at 25 cents per copy. Designations of the specifications according to sponsor are: B 225-48T—American Society for Testing Materials, 1916 Race St., Philadelphia 3; and A5.6-48T—American Welding Society, 33 W. 39th St., New York 17.

## Standard Sizes

Standard size of electrode refers to diameter of core wire:

| Core Wire, In. | Length, In. |
|---|---|
| 3/32 | 9 or 12 |
| 1/8, 5/32 and 3/16 | 14 |
| 1/4 and 5/16 | 18 |

Standard packages are of 25 or 50 lb.

## Uses for Electrodes

System of identification: Letter *E* denotes an arc-welding electrode; symbol "Cu" identifies electrode as a copper-base alloy; third symbol, as "Sn" or "Ni" indicates the alloying element.

*E Cu (Copper) Classification*—Deoxidized copper core wire is used where weld metal must have high electrical conductivity or corrosion resistance comparable to annealed, wrought copper.

*E CuSn (Phosphor Bronze) Classifications*—These electrodes are used for joining copper, phosphor bronze of similar analysis, low-strength brasses, cast iron and other ferrous metals and dissimilar metals; for surfacing, for bearing, wear and corrosion resistance also.

The CuSn-A electrodes may be used for welding copper when their lower electrical conductivity is not objectionable and their chemical composition is satisfactory from a corrosion-resistance standpoint. Cold working of the weld metal should be followed by annealing.

*E CuNi (Copper-Nickel) Classification*—Electrodes of this classification are most commonly used for joining 20% and 30% copper-nickel sheets and plates, and for joining these metals to steel, cast iron and the nickel-copper alloys.

*E CuSi (Copper-Silicon) Classification*—Electrodes of this classification may be used for welding copper and for overlaying steel, cast iron and other metals to provide corrosion resistance, wear resistance and bearing surfaces. These electrodes are used in the fabrication of chemical apparatus from plate, sheet and castings of copper-silicon alloys. The use of metal-arc welding for this material is relatively new, oxyacetylene and carbon-arc welding being the more common welding processes used in the past.

*E CuAl (Aluminum-Bronze) Classifications*—Electrodes of all classifications in the aluminum-bronze series contain aluminum, iron and copper. They are characterized by high tensile strength and yield strength and relatively high hardness.

Electrodes conforming to classification E CuAl-A are used for welding high-strength copper-zinc alloys, aluminum bronzes of similar composition, many ferrous alloys and combinations of dissimilar metals. The weld metal is suitable for overlays for bearing, wear resistance and corrosion resistance.

Electrodes conforming to classification E CuAl-B have a slightly higher tensile strength and lower ductility than E CuAl-A. They are used for similar applications where higher tensile strength is desirable and the lower ductility is not objectionable.

Electrodes conforming to classification E CuAl-C have the highest tensile strength of all classifications of aluminum-bronze electrodes, with relatively high hardness. For this reason they are particularly suited for bearing overlays where resistance to high unit loadings against hardened steel or where wear is involved. These electrodes are also used for joining aluminum-bronze of similar analysis.

Electrodes conforming to classification E CuAl-D are used for application similar to those of E CuAl-C. They produce weld metal which is lower in tensile strength and ductility but higher hardness.

Classification E CuAl-E electrodes yield weld metal having the highest hardness obtained with aluminum-bronze electrodes. The weld metal has excellent bearing qualities and wear resistance. For these reasons, these electrodes are often used for surfacing on forming and drawing dies and surfaces subjected to similar service.

### MECHANICAL REQUIREMENTS OF ALL-WELD METAL SPECIMENS

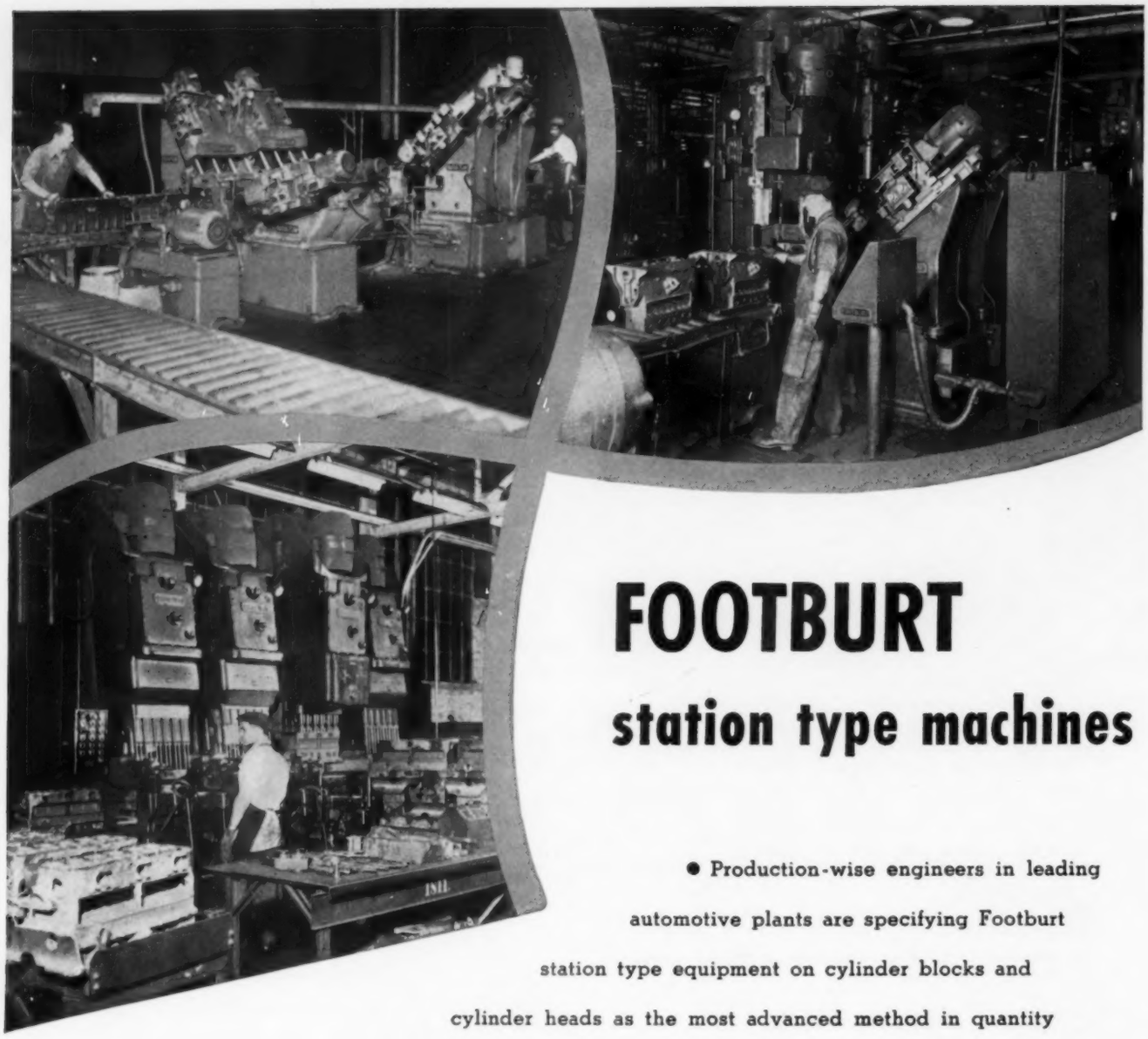
| Electrode Classification | Tensile Strength, min., psi. | Yield Strength (0.5 per cent Extension Under Load), min., psi. | Elongation in 2 in., min., per cent | Brinell Hardness Number |
|---|---|---|---|---|
| E Cu (copper) | 25 000 | not specified | 20 | not specified |
| E CuSn (phosphor bronze): | | | | |
| A | 40 000 | 20 000 | 15 | 70 to 85 (500-kg. load) |
| C | 45 000 | 25 000 | 12 | 85 to 100 (500-kg. load) |
| E CuNi (copper-nickel) | 45 000 | 25 000 | 25 | not specified |
| E CuSi (copper-silicon) | 40 000 | 20 000 | 20 | 80 to 100 (500-kg. load) |
| E CuAl (aluminum bronze): | | | | |
| A | 65 000 | 30 000 | 15 | 130 to 160 (3000-kg. load) |
| B | 70 000 | 35 000 | 10 | 160 to 210 (3000-kg. load) |
| C | 75,000 | 40 000 | 4 | 210 to 260 (3000-kg. load) |
| D | 65 000 | 45 000 | not specified | 260 to 310 (3000-kg. load) |
| E | 70 000 | 50 000 | not specified | 310 to 365 (3000-kg. load) |

### CHEMICAL REQUIREMENTS FOR ELECTRODES

| Element, per cent | Electrode Classification | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | E Cu (Copper) | E CuSn (Phosphor Bronze) | | ECuNi (Copper-Nickel) | E CuSi (Copper-Silicon) | E CuAl (Aluminum Bronze) | | | | |
| | | A | C | | | A | B | C | D | E |
| Tin | not specified | 4.0 to 6.0 | 7.0 to 9.0 | * | not specified | * | * | * | * | * |
| Silicon | not specified | * | * | * | 2.5 to 3.75 | 0.55 max. | p.55 max. | 0.55 max. | 0.55 max. | 0.55 max. |
| Manganese | not specified | * | * | * | not specified | * | * | * | * | * |
| Iron | * | * | * | * | not specified | 1.5 max. | 3.0 to 5.0 | 3.0 to 5.0 | 3.0 to 5.0 | 3.0 to 5.0 |
| Nickel | * | * | * | 29.0 min. | not specified | 0.5 max. | 0.5 max. | 0.5 max. | 0.5 max. | 0.5 max. |
| Aluminum | * | * | * | * | * | 7.5 to 9.0 | 9.0 to 10.0 | 10.0 to 11.0 | 11.0 to 12.0 | 12.0 to 13.0 |
| Phosphorus | 0.3 max. | 0.3 max. | 0.3 max. | * | * | * | * | * | * | * |
| Lead | 0.02 max.* | 0.02 max.* | 0.02 max.* | 0.02* | 0.02 max.* | 0.02 max.* | 0.02 max.* | 0.02 max.* | 0.02 max.* | 0.02 max.* |
| Copper | 99.0 min.[b] | remainder | remainder | 67.0 min. | 94.0 min. | remainder | remainder | remainder | remainder | remainder |
| Total impurities[a] | 0.2 max. | 0.5 max. | 0.5 max. | 4.0 max. | 0.5 max. | 0.10 max. | 0.10 max. | 0.10 max. | 0.10 max. | 0.10 max. |

[a] Total impurities, including the elements marked with an asterisk (*), shall not exceed the value specified.

[b] Including silver.



# FOOTBURT

## station type machines

● Production-wise engineers in leading automotive plants are specifying Footburt station type equipment on cylinder blocks and cylinder heads as the most advanced method in quantity manufacturing. Similar operations that ordinarily require several separate machines are grouped in one station machine thus greatly reducing handling and providing better production control. Combining of valve hole operations, cylinder boring, the majority of drilling and the majority of tapping are outstanding examples of this latest production trend.

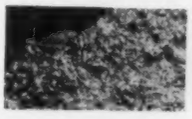
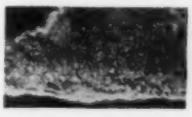
THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

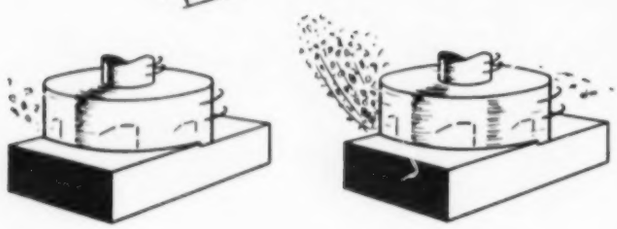
**FOOTBURT MACHINE TOOLS** *Engineered* FOR PRODUCTION

# Shop Tests for Identifying Cast Irons

*Courtesy Linde Air Products Co.*

| | What to Notice | White Cast Iron | Gray Cast Iron | Malleable Iron |
|---|---|---|---|---|
| APPEARANCE | FRACTURE | Very fine silvery-white silky crystalline formation. Will not smudge finger |  Dark gray; will smudge finger |  Dark gray except for lighter outer layer |
| | UNFINISHED SURFACE | Evidence of sand mold; dull gray | Evidence of sand mold; very dull gray | Evidence of sand mold; dull gray |
| | NEWLY MACHINED SURFACE | Rarely machined. Difficult to machine or file | Fairly smooth; light gray | Smooth surface; light gray |
| CHIP TEST | DUCTILITY | Brittle, breaks without bending | Brittle, breaks without bending | Can be bent moderately |
| | APPEARANCE OF CHIP | Small broken fragments | Small partially broken chips but possible to chip a fairly smooth groove | Chips do not break short as in cast iron |
| | SIZE OF CHIP | — | ⅛ in. | ¼-⅜ in. |
| | FACILITY OF CHIPPING | Brittleness prevents chipping a path with smooth sides | Not easy to chip because chips break off from base metal | Very tough therefore harder to chip than cast iron |
| BLOWPIPE TEST | COLOR CHANGE WHILE HEATING | Becomes dull red before melting | Becomes dull red before melting | Becomes red before melting |
| | APPEARANCE OF SLAG | A medium film develops | A thick film develops | A medium film develops |
| | APPEARANCE OF MOLTEN PUDDLE | Fluid and watery; reddish white | Fluid and watery; reddish white | Fluid and watery; straw color |
| | ACTION OF MOLTEN PUDDLE UNDER BLOWPIPE FLAME | Quiet; no sparks; depression under flame disappears when flame is removed | Quiet; no sparks; depression under flame disappears when flame is removed | Boils and leaves blowholes; surface metal sparks; interior does not |
| SPARK TEST | | Average stream length with power grinder - 20 in. Volume - very small Sprigs - finer than gray iron, small and repeating | Volume - small Many sprigs, small and repeating | Average stream length with power grinder - 30 in. Volume - moderate Longer shafts than gray iron ending in numerous small, repeating sprigs |

# Short-Cuts to Good Milling ...by Stainless Sam

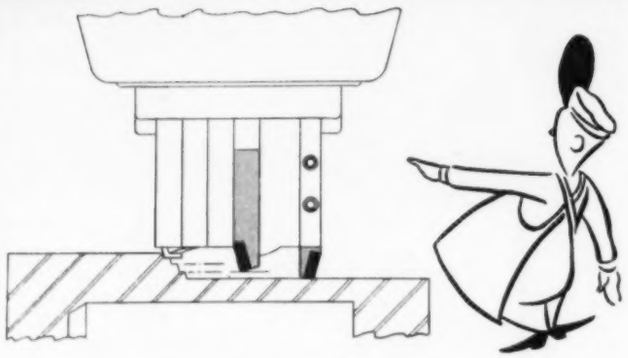


**1**

Either conventional high speed steel tools or carbide tools can be used for milling Stainless Steels.

Carbide tools are usually of no advantage on old under-powered machines. But with modern heavy-duty equipment, large quantity production, and sufficient power, carbide tools often make it possible for you to increase cutting rates 100% and more. Minimum feed per tooth of .005" is recommended.

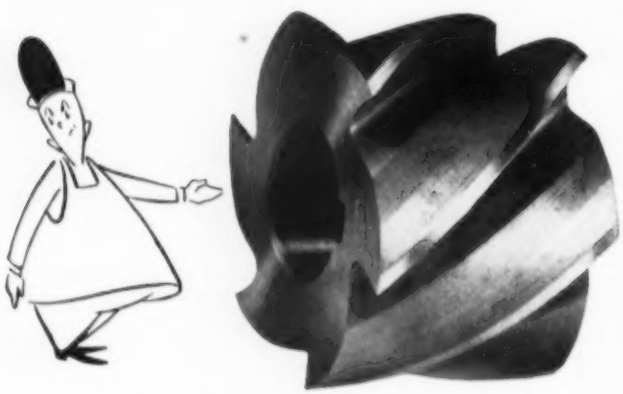
Actually, feeds and speeds with carbide tools are limited only by facilities for chip disposal and by available horsepower.



**2**

For face milling on heavy-duty equipment, Stainless Sam recommends a high speed steel with cobalt addition, or cast alloy types for the cutting edges of face mill blades.

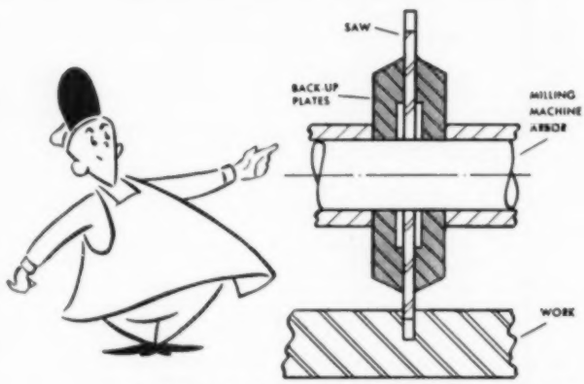
Carbide-tipped cutters may be used economically on step mills (modified face mills with inserted tools). Step mills are designed for deep cuts at relatively low feeds per revolution. With cutting edges set at progressively greater depths, only one tool makes the final finishing cut. (See drawing.)



**3**

Because of its positive shearing action the helical type slab milling cutter is used for all types of Stainless Steels. Heavy table feeds and slow spindle speeds should be used for the chromium-nickel grades.

Conventional milling is recommended for older equipment. With newer machines, or old equipment provided with a back-lash eliminator, climb milling may give best results.




**4**

Teeth should be properly backed off when sawing Stainless Steels with high speed steel circular saws. Coarse tooth saws with staggered teeth are recommended for deep, wide cuts. Fine tooth saws should be used for light sections.

Whenever possible, heavy spacing collars should be mounted on each side of the saw to strengthen the blade (see drawing). Diameters of the collars should be as large as the depth of the cut will permit.

Milling Stainless Steels is only one of many subjects discussed in Armco's valuable new booklet on machining.

Write for your copy today. It may surprise you to know how easy it is to machine ARMCO Stainless Steels with standard equipment.

And you may be in line for another pleasant surprise if you make a cost-study of each part of your product—comparing Stainless with the material you are using now.

When you write for a copy of the booklet, just ask for "Machining of ARMCO Stainless Steels." Address Armco Steel Corporation, 500 Curtis Street, Middletown, Ohio.

*Export: The Armco International Corporation*

**ARMCO STAINLESS STEELS**

ARMCO

American Machinist REFERENCE BOOK SHEET

# Safe Use of Organic Solvents

COURTESY: SAFETY RESEARCH INSTITUTE

Organic solvents are liquids that have excellent solvent capacity for grease, paints and resins. For this reason, they are very useful as degreasers, thinners, paint removers and similar applications. Also, because these liquids are extremely volatile, they may be used where rapid drying is necessary. But if solvents are employed without precautions, the vapors (always present to some extent) may cause illness or fire, or both.

Inhalation of extremely small amounts of vapor (less than can be detected by odor) on a continuous basis, or infrequent inhalation of larger amounts for, say a few minutes, are not likely to cause trouble. But prolonged breathing of unsafe amounts of vapor may result in dizziness, weakness, headache, nausea or stomach pains. If the individual continues to inhale too much solvent vapor, serious illness may occur, resulting from damage to kidneys, liver, blood, nervous system or other parts of the body. Also, breathing high concentrations of vapor, even for short periods of time (as in wiping up a large spill of solvent or in cleaning a solvent tank), may result in death.

In addition to poisoning, careless or improper use of solvent may present a fire hazard since vapors of common solvents (with the exception of carbon tetrachloride, trichlorethylene and perchlorethylene) are flammable.

Moreover, because they have excellent dissolving power for oils, solvents may cause drying of the skin if the hands are often wet with the liquid. Dermatitis may result.

Most solvent accidents occur with small-scale, intermittent, or occasional use of solvents, either as the result of lack of understanding or inadequate safety measures. For such applications, the following check list may be helpful.

**1. Is Solvent Distribution Properly Supervised?**

*Yes, if solvents are all kept in one storage area, under the supervision of a responsible person who distributes solvents for authorized purposes only.* Allowing workmen to help themselves to solvents, unauthorized uses and substitutions of a new solvent by a workman on his own responsibility are major causes of solvent accident.

**2. Are Solvent Operations Properly Designed?**

*Yes, if operations and equipment have been planned in terms of the properties of the specific solvents used and the type of operation involved.* Manufacturers of solvents and of solvent-using equipment are glad to assist in planning procedures. Also industrial hygiene divisions of national, state or local health or labor departments may be called upon for advice without charge. In many states and cities, approval of plans by the appropriate authority is a legal requirement.

**3. Are Solvent Operations Properly Supervised?**

*Yes, if the foreman or head of the department is himself adequately informed and checks all solvent operations.*

**4. Is There Protection Against Solvent Vapors?**

*Yes, if solvent is used in completely inclosed equipment or with local exhaust designed specifically for the operation involved or in a suitably ventilated room.* For occasional jobs and for emergencies (for instance, unloading damaged drums of solvent an approved supplied-air respirator or suitable gas mask can give protection.

**5. Is There Protection Against Dermatitis?**

*Yes, if work is arranged so that hands are not dipped into solvents or if solvent-resistant gloves are worn.* Protective creams are helpful. Where solvents are used frequently, adequate washing facilities encourage cleanliness and thus reduce skin difficulties.

**6. Is There Protection Against Fire?**

*Yes, if the recommendations of the National Fire Protection Association are observed where flammable solvents are used.* Use of non-sparking tools, fire-safe electrical equipment and installations, good housekeeping, prohibition of smoking, and provision of hand fire extinguishers are major safeguards.

**7. Are Solvent Containers Suitably Designed?**

*Yes, if solvent containers can be kept tightly closed.* If containers must be opened frequently, self-closing, or "safety," cans should be used.

**8. Is Equipment Properly Maintained?**

*Yes, if equipment is checked regularly, kept clean and in good repair.* Ventilating equipment should be examined regularly to assure that dirt and corrosion do not interfere with proper operation. Leaky containers should be repaired or replaced. Contents and parts of gas masks and fire extinguishers should be checked periodically.

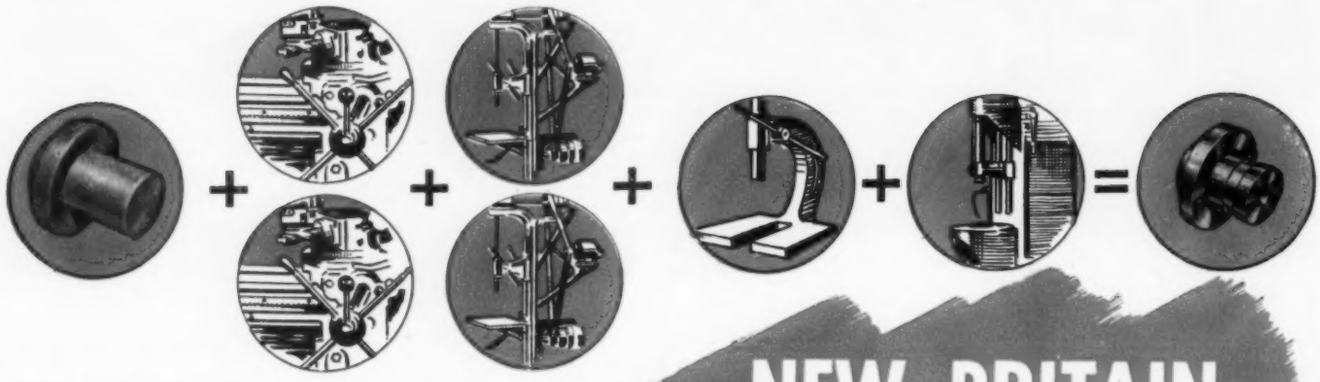
**9. Are Workers Informed of Hazards and Precautions?**

*Yes, if solvent containers are clearly labeled as to contents and workers have been taught the significance of safety regulations.* Workers should understand why they are asked to observe "no smoking" rules, to handle solvents without spillage, or to report solvent odors promptly, and how to use gas masks, fire extinguishers and other equipment provided for their protection.

**10. Is Medical Protection Provided?**

*Yes, if workers are examined before using solvents and immediately upon occurrence of any symptoms.* Because workers differ in their susceptibility to solvents, it is advisable to have them examined before they are assigned to work with these chemicals. If they are to do such work regularly, even in operations involving small quantities of solvent, medical check-up at intervals is desirable. Any worker suffering with symptoms such as dizziness, nausea, or stomach upset should be referred to a physician promptly.

# If you are doing this . . .



# put the whole job on a . . NEW BRITAIN AUTOMATIC

In many plants, this sort of operation has been going on for years . . . on the theory that the run was too short for an automatic . . . or because "It couldn't be done economically on an automatic."

The squeeze between manufacturing costs and selling prices has prompted many a company to take a considered "second look" at such operations. As a result, a wide variety of pieces are now being completely machined on New Britain automatics, with important economies in manpower, machines, floor space and cost per piece . . . together with improved quality of work.

## These features help cut cost per piece on NEW BRITAIN CHUCKERS

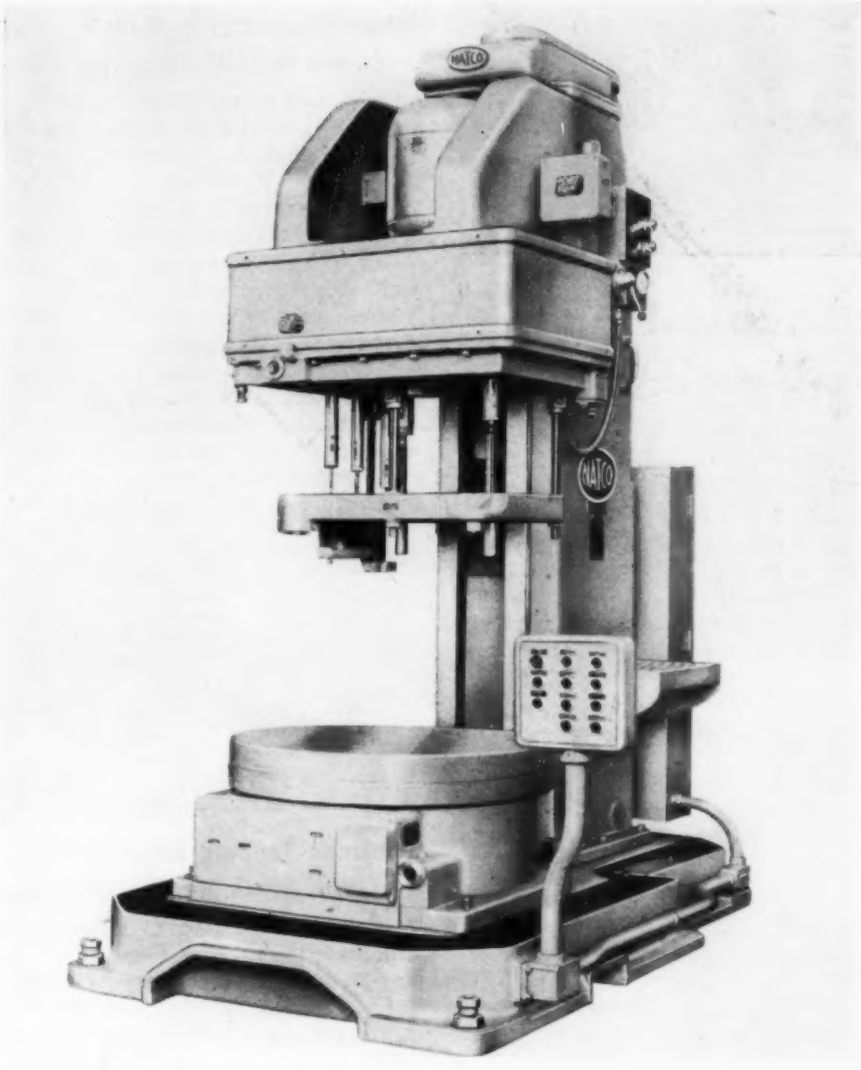
- *Double Indexing* of spindle carrier with loading in two positions can be provided to complete both ends of a piece on a single machine.
- *Spindles May Be Stopped* to permit accurate alignment of part for many secondary operations.
- *Open End Construction* reduces setup time and makes tool adjustment easy.
- *Variable Chucking Pressures* in last positions prevent distortion of thin-walled or fragile pieces.

**The piece sketched illustrates many typical second operations which New Britains can eliminate. Get the facts and figures on actual jobs. Send for the free folio "Cost Histories". It may suggest a solution to multiple operations which are bottlenecking your production.**

1148ML1

THE NEW BRITAIN MACHINE CO.
NB
NEW BRITAIN
Automatics
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

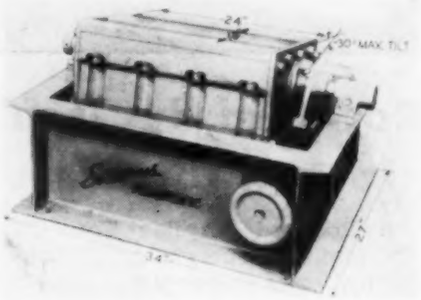
# Shop Equipment News



## Natco Offers Three Single-Spindle, Fixed-Center Multi-Spindle Machines

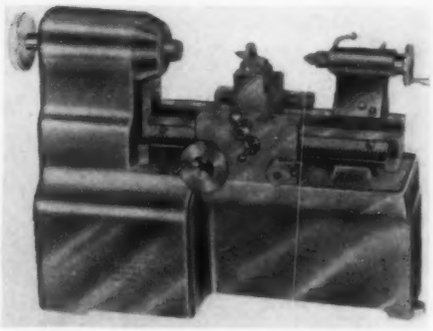
The Models C2A, illustrated, C3A, and C4A Holesteel vertical machines are offered by National Automatic Tool Co., Richmond, Ind., for production drilling, boring, tapping and similar operations. The electrically controlled hydraulic-feed system provides an infinitely variable-feed selection within the range of the machine. Models C2A, C3A, and C4A are of both single-spindle and fixed-center multiple-spindle construction.

The C2A and C3A machines can be supplied with an adjustable knee-type table. Combination drilling and tapping heads are provided with an independent reversing-type motor for the tapping spindle drives. Spindle diameters are 3½, 4, and 4 in., respectively for the three models. Feeding rate varies from 1 to 10 ipm. on the three machines. Standard stroke of the head or head slide is 18 in. for both the C2A and C3A models, and 21 in. on C4A model. A step-drilling attachment is available for drilling deep holes.

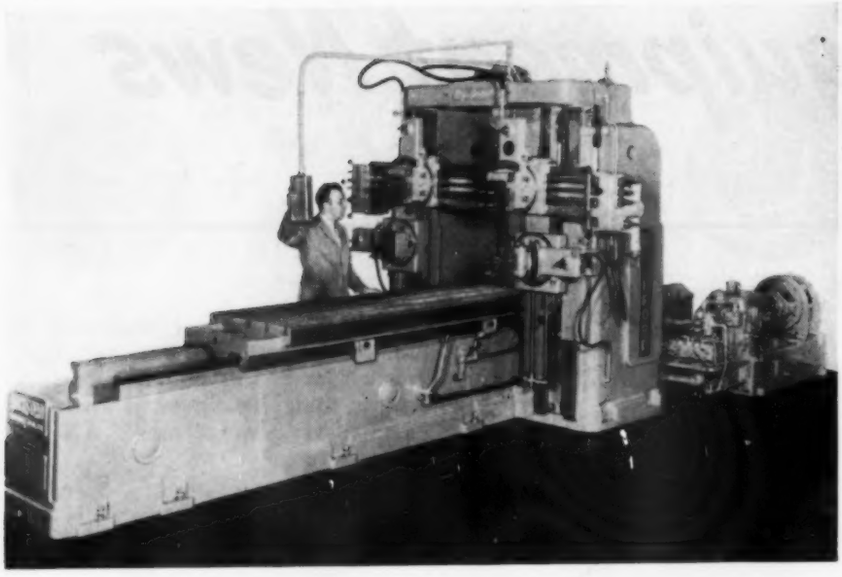


### Stearns Magnetic Tilting Frame For Grinder Holding Magnets

A tilting frame as auxiliary equipment for its grinder holding magnet designed to grip castings and other material, is offered by Stearns Magnetic Mfg. Co., Milwaukee 4, Wis. Tilting frames allow for positioning work in a 30° arc, and are designed to accommodate grinder holding magnets of 16x14 in., 16x24 in. and 16x40 in.



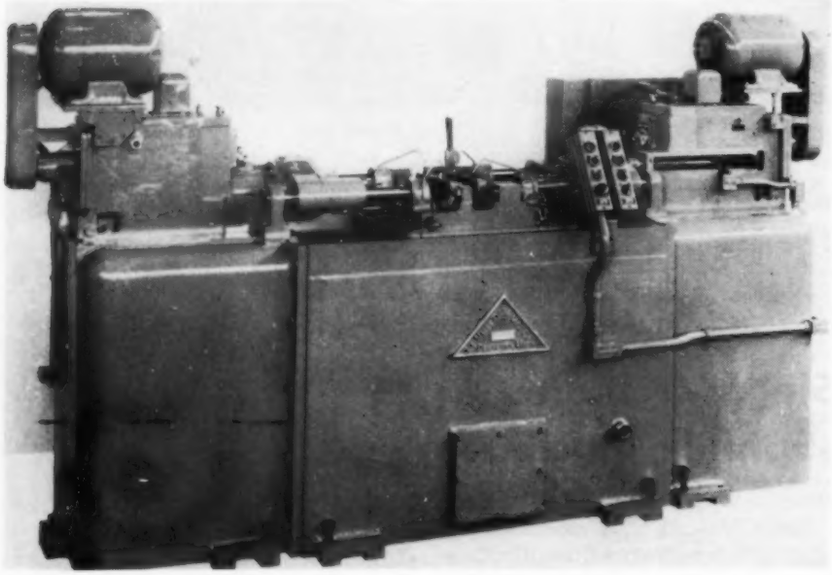
**SMALL LATHE for metal-turning is offered by Small Machines, Inc., West Los Angeles, Calif. Listed as the Duo-Lathe, it is 10½x7¼x3¾ in. A self-contained universal motor is mounted in the base. The lathe has a speed range of from 100 to 3000 rpm., and is equipped with back gears which can increase its power as much as 20 times**



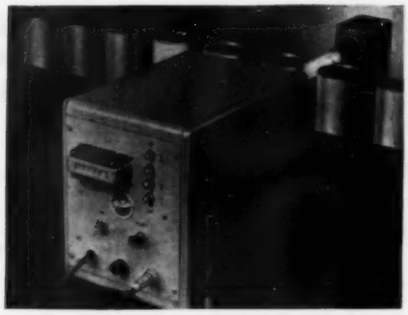
## Rockford Hy-Draulic Shaper-Planer Incorporates Double-Housing Design

The Rockford Machine Tool Co., Rockford, Ill., offers a double-housing hydraulic shaper-planer, said to combine the speed of a shaper with the accuracy of a planer. Hydraulic pressure is used for the feeds as well as table drive.

Dual controls are featured for the rail head and table and can be supplied with two toolheads with automatic tool lifters for the crossrail, and also two side heads with automatic tool lifters. Shaper-Planer is offered in three sizes; 24 x 24, 30 x 30, and 36 x 36 in. Stroke lengths of 6, 8, 10 and 12 ft. are built in each size. The second crossrail head and side heads are extra equipment.



HYDRAULIC-FEED DRILLING UNIT, made by Le Maire Tool & Mfg. Co., 2657 South Telegraph Road, Dearborn, Mich., is illustrated on a Le Maire two-way, four-spindle, horizontal drilling machine used to drill cross holes in a steering idler arm. Two drilling units are shown mounted on the two end bases. A single ram is used to provide the hydraulic feed. Listed as No. 1000 drilling unit, the speed rate is 135 rpm. for rapid approach and return. Slow feeds can be varied from ¼ to 35 rpm. by turning a dial



### Potter Photoelectric Counter Counts to 6000 Pieces per Min.

A high-speed photo-electric counter is introduced by the Potter Instrument Co. Inc., 136-56 Roosevelt Ave., Flushing, N. Y. Listed as the Model 310 counter, it is a self-contained package including a photo-electric detector, electronic decade and a six-digit electromechanical register.

The electronic counter decade ahead of the electromechanical register scales down the speed by a factor of ten, thereby increasing reliability and accuracy. Small objects as well as closely spaced parts can be counted since the beam width is only ¼ in. and responds to light changes.

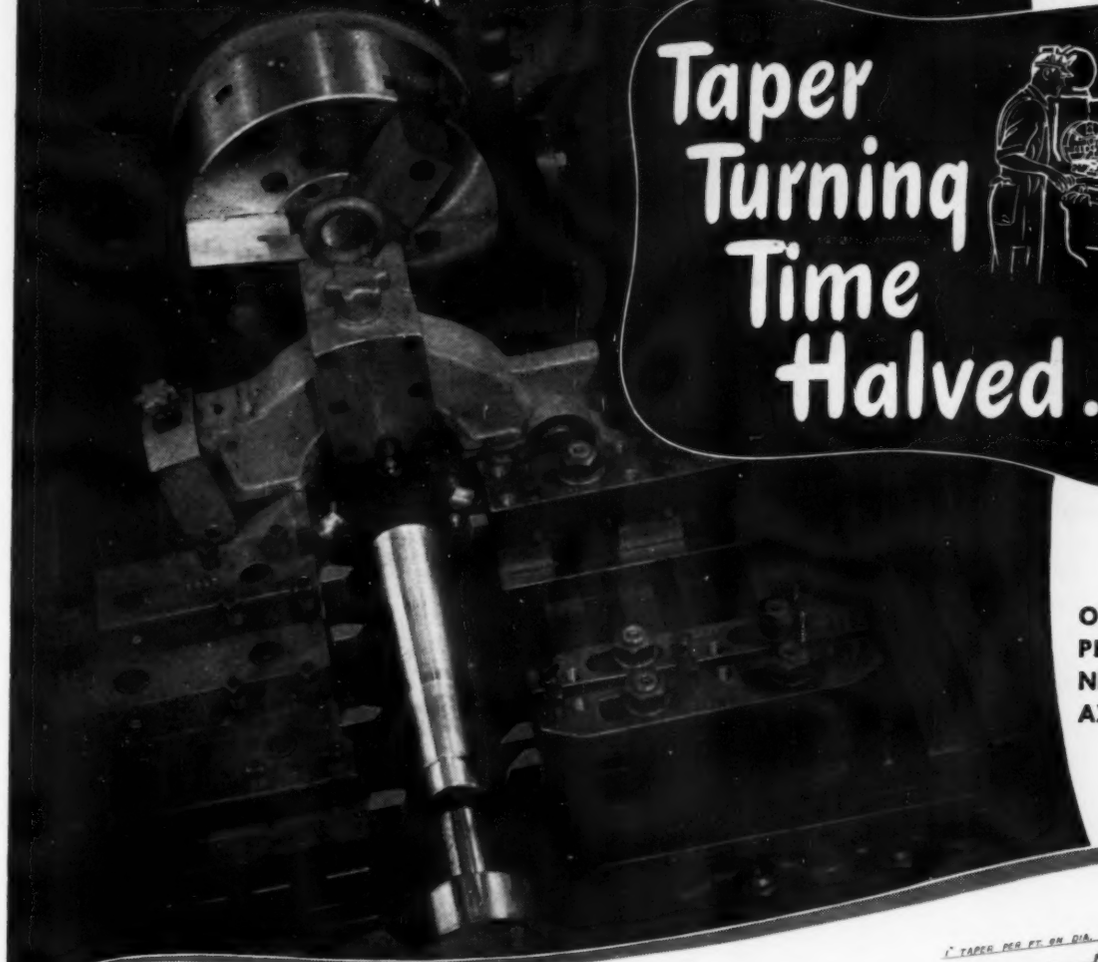
### Wickman Tapping Attachment Will Eliminate Tap Breakage

A tapping attachment, designed to eliminate tap breakage, known as the Jay-Dee is marketed by Wickman Mfg. Co., 15533 Woodrow Wilson Ave., Detroit 3, Mich. The attachment is said to guarantee tap safety. No coil springs are used to provide driving pressures. A resilient material delivers a safe cutting torque and protects tap regardless of load.

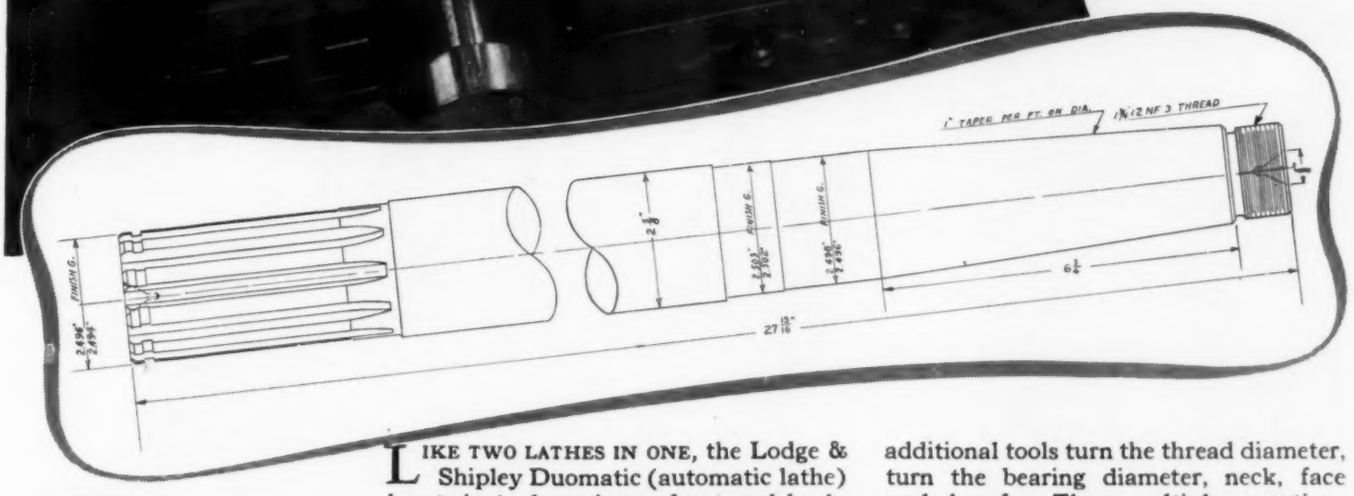
The attachment can be used with all types of reversible machines for horizontal or vertical tapping, and for blind and through holes. Four index stations, listed according to tap size on the body of the attachment can be selected and provide a positive setting for a wide variety of materials. No wrenches are required in changing taps. The Jay-Dee comes in three models with Morse taper shanks, with ranges from 3/16 to 1¾ in.

LODGE & SHIPLEY DUOMATIC LATHES at work...

# Taper Turning Time Halved....



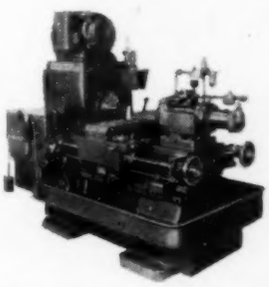
**OTHER OPERATIONS PERFORMED SIMULTANEOUSLY ON TRACTOR AXLE . . .**




LIKE TWO LATHES IN ONE, the Lodge & Shipley Duomatic (automatic lathe) has twin tool carriages, front and back, operating singly or simultaneously . . . performing a wide variety of operations automatically. All the operator does is to load the workpiece, start the cycle and then remove the workpiece.

In the job illustrated above, turning an axle for a tractor, two taper cuts are taken at the same time, to halve taper turning time. Each of two tools cut half the distance on the taper, while additional tools turn the thread diameter, turn the bearing diameter, neck, face and chamfer. These multiple operations complete the piece in 1.8 minutes.

With two tool carriages, the Lodge & Shipley Duomatic naturally saves time in machining. Change-over time is cut sharply too, for there are no cams to change on the Duomatic. Lodge & Shipley Engineers will gladly explain these and other Duomatic features . . . show you how Duomatics can produce profitably for you.



*There are two Duomatic models, the 2-A for the small job and the 3-A for larger work. Write for Catalogs No. 634 and No. 635.*

THE **Lodge & Shipley** COMPANY

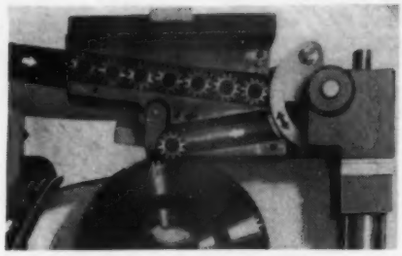
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

## Reduceroll by National Machinery For Pre-Forming Forging Blanks

The National Machinery Co., Tiffin, Ohio, offers the Reduceroll, designed to reduce or pre-form forging blanks by rolling, to accurately distribute the stock to meet the requirements of the final forging. The machine can be used with hammers or forging presses, and does the same work as the Maxiroll, the auxiliary Maxipres pre-forming attachment. It is built in five sizes, covering the range of forging operations handled by the complete Maxipres line.

## Self-Contained Dust Collector Offered for Continuous Operation

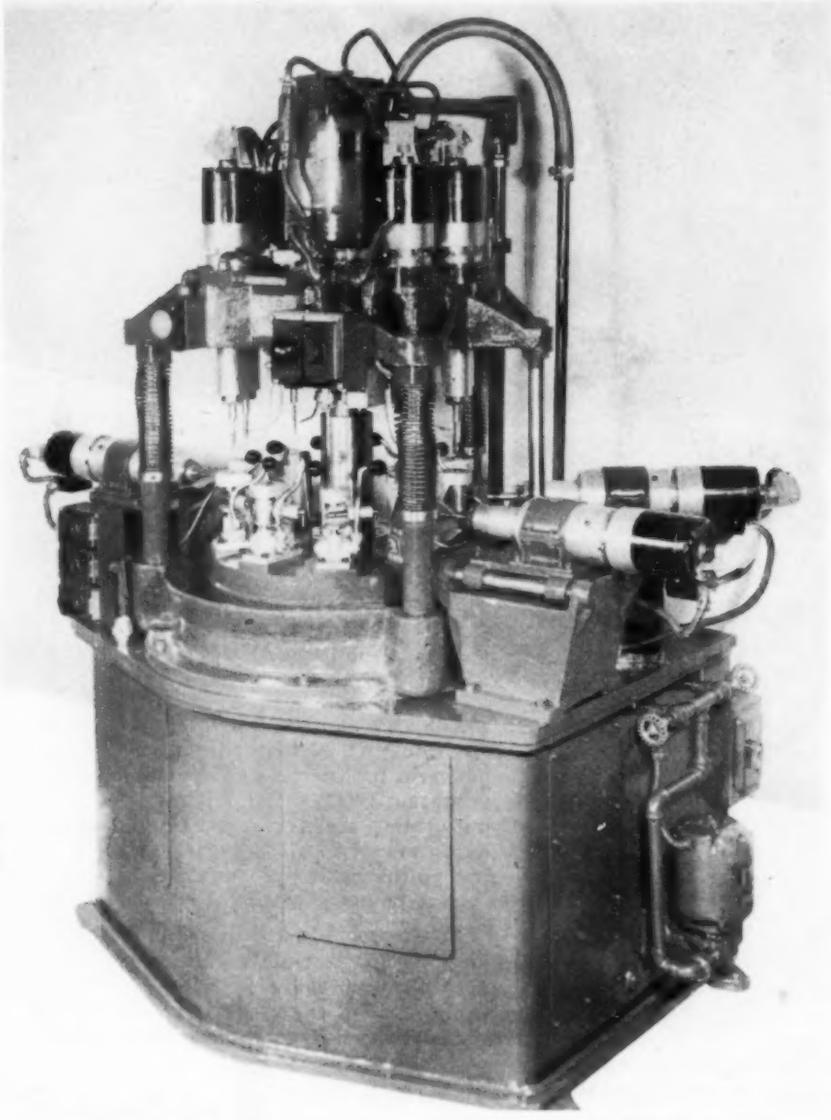
A portable self-contained dust collector for collecting dust from small wheel grinding and sanding, and lint from buffing and polishing operations, is offered by Aget-Detroit Co., 396 Main at Washington St., Ann Arbor, Mich. Listed as the Model 335 Dustkop, it can be used for continuous work on production operations. The over-all size is 12x14x18 in. and weight is 43 lb. A rating of 320 cfm. at 1½-in. water lift on a 3-in. inlet is developed by a continuous-duty, 3600-rpm. 1/3-hp. motor.



## Automatic Loading Devices For Gear-Finishing Machines

A line of automatic loading devices for gear-finishing machines to suit varied production requirements is introduced by Michigan Tool Co., 7171 E. McNichols Road, Detroit, Mich. The devices automatically reduce idle time per machine to 2 sec. per gear or less. They are designed for use on both rack- and rotary-type gear-finishing machines, and can be applied to Michigan machines already in use.

The use of arbors for mounting of gears and pinions between centers is unnecessary. Special pneumatic headstock centers act as an arbor. Stripping from the center is also automatic. Production rates are said to be as high as 300 pinions per hr. per machine. Loaders fall into three major classes: gravity chute feed and unload type for smaller gears; chute feed plus indexing mechanism for positive loading; and jaw type loaders for larger gears and cluster gears. Illustrated is a gravity-chute type feed.

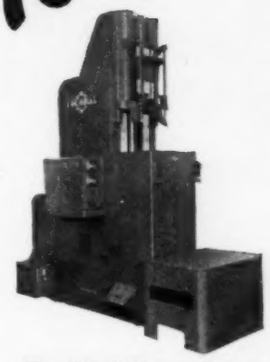


SPECIAL AUTOMATIC MACHINE for drilling and reaming refrigerator parts is made by Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich. The machine incorporates nine units and is an automatic type with dial feed using lever-operated pump jigs to hold the part

# When it comes to broaching—

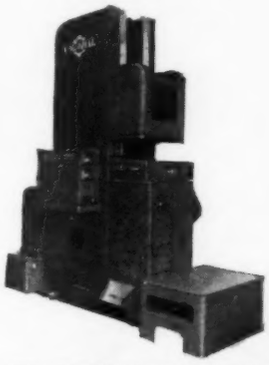
## THESE NEW COLONIALS

**will cut not only costs and time but "headaches" too**



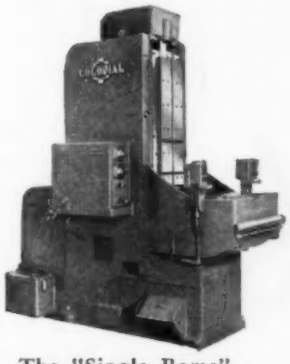
The "Pull-Downs"... outstanding for internal broaching of large parts.

**Bulletin RD-48**



The "Pull-Ups"... for fast internal broaching. Automatic unloading for small parts.

**Bulletin RU-48**

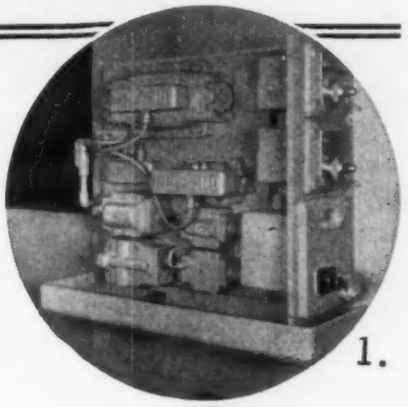


The "Single Rams"... there is nothing to equal them* for surface broaching.

**Bulletin RS-48**

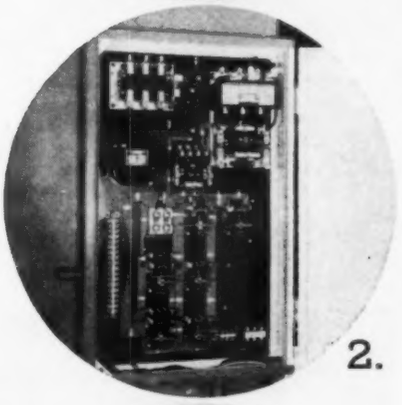
**Except a Colonial "Dual Ram." For shorter runs, the Universal Horizontal is the machine for you.*

## Here are some of the "inside" reasons:—



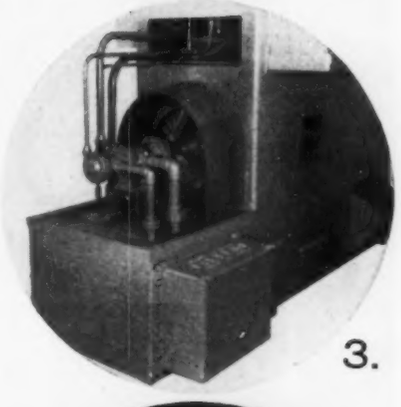
1.

All hydraulic units are grouped externally (cover removed). Valves are so made you can remove them without disturbing or draining the piping.



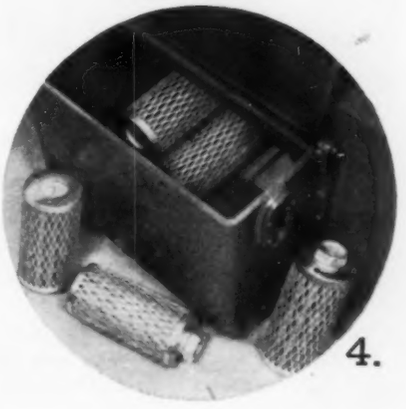
2.

You won't have any trouble tracing circuits on this enclosed electrical panel.



3.

Scientific forced draft cooling of everything inside the machine is one of the reasons for the absence of service difficulties.



4.

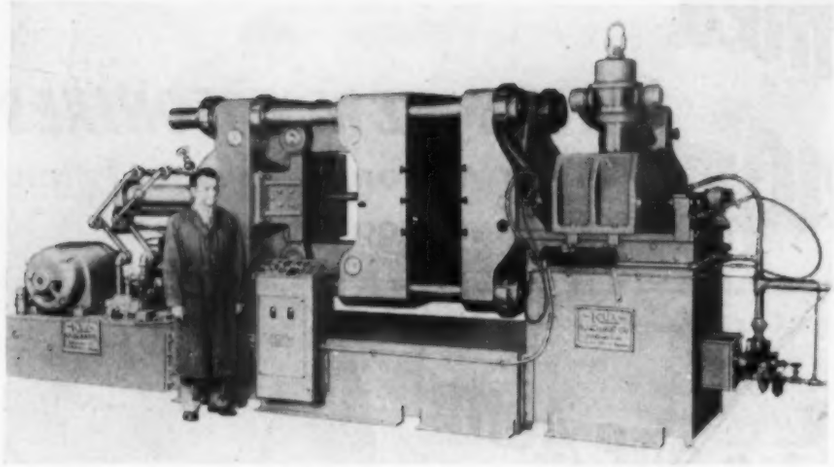
It's easy to keep the hydraulic system clean. You can remove, inspect and clean the filters without stopping the machine.

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

BEST BY TEST



## Kux Standard Die-Casting Machine Features 800-Ton Locking Pressure

A standard die-casting machine is offered by Kux Machine Co., 3940 West Harrison St., Chicago, Ill., in three varied models. Machine has an 800-ton locking pressure and will form castings in zinc weighing to 30 lb., and in aluminum weighing to 10 lb.

High injection pressures are utilized, reaching as much as 40,000 psi. Die space between the tie-bars is 40 x 25 in.; die separation is 17½ in. The machine is hydraulically operated and electrically controlled. Production is said to be from 3 to 4 zinc-casting cycles, or two aluminum-casting cycles per min. The die-casting cycle is pushbutton controlled.

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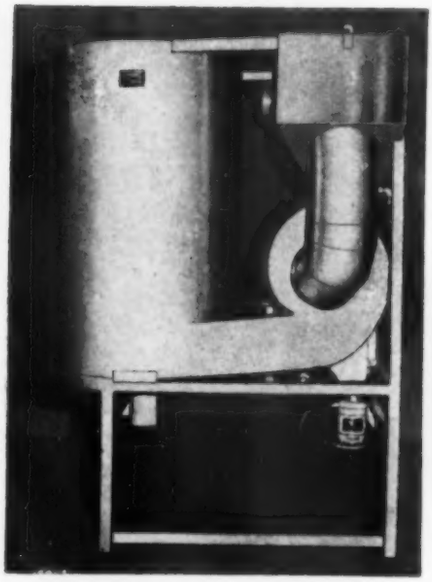


### Dust and Foreign Particles Removed From Air by Niehaus Dust Separator

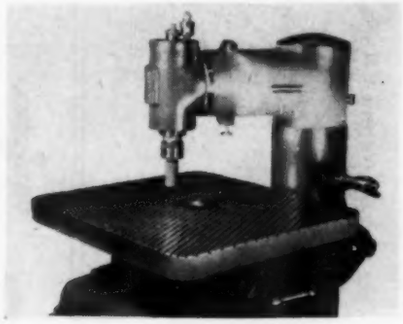
The Niehaus dust separator employing water action to remove from the air dust and foreign particles resulting from polishing, buffing, and grinding operations, is offered by Industrial Electroplating Co. Inc., 219 W. Vermont St., Indianapolis 4.

The separator, by high centrifugal action, mixes finely divided particles of water with the dust-laden incoming air and washes out the foreign material. Refuse is collected in a portable tank beneath the unit. Clean air is discharged from the top of the machine into the room, eliminating loss of heat.

### Pultra Micro Lathes Offer 4-in. Swing Over the Bed

Lorber Export Import & Purchasing Co., 475 Fifth Ave., New York 17, N. Y., offers the Pultra Micro lathes available in 22 standard combinations. The lathe has a 4-in. swing over bed with a maximum center distance of 7 in. between headstock and tailstock, and a maximum standard spindle speed of 6000 rpm. adjustable to run up to 12,000 rpm., while the spindle bore is of 10 mm. size.

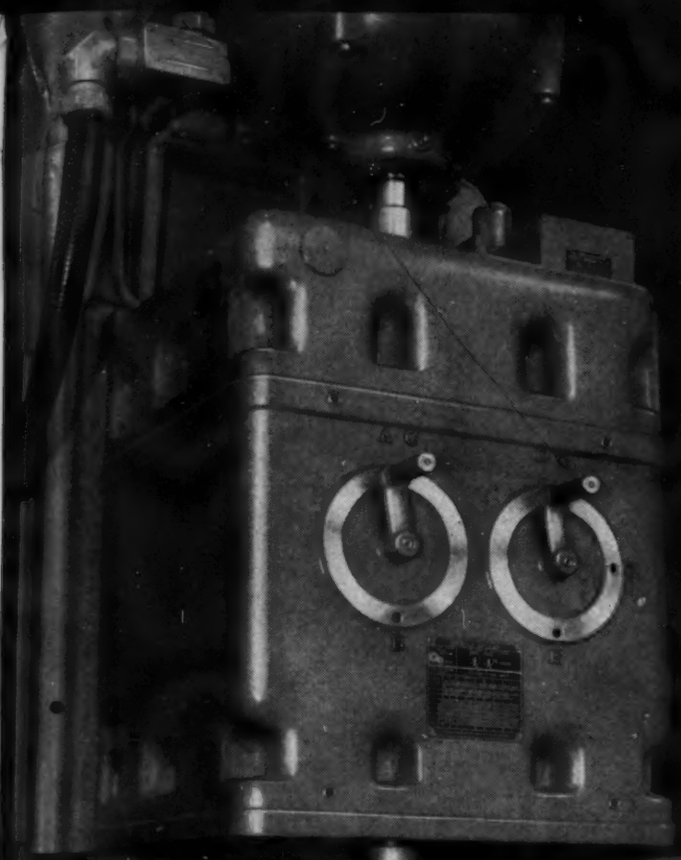
Listed as the Series 17 Pultra Micro lathe they are offered in a range of headstocks, tailstocks, slides, and other parts which are interchangeable and which are called basic units. Lathes can be used for turning, polishing, saw cutting, drilling, milling and grinding of small parts in toolroom and production work, as well as many other uses.



### Special Collet Chuck for Holding Wheel Offered on Profile Grinder

Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., offers the No. 2 profile grinder with an improved method for holding grinding wheels. A specially designed double-taper collet chuck is attached to the top of the spindle. The chuck accommodates collets in sizes from ⅛ to ⅝ in. in steps of ⅛-in. Wheels with any shank size within the limits of these dimensions can be used.

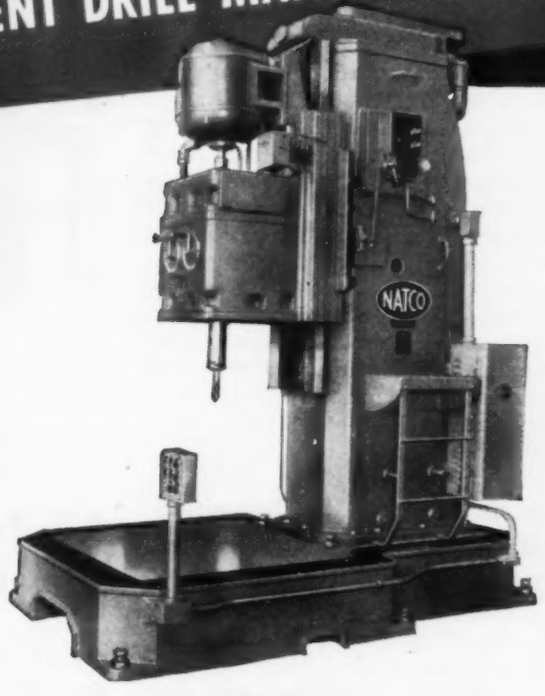
**WIRE ROPE SLING made by Palmer-Shile Co., 16019 Fullerton Ave., Detroit 27, Mich., is made of improved plow-steel. Two 6-in. loops are spliced in and sewed with tape. Slings are offered in four, ⅛-in. rope diameters from ⅜ to ¾ in., in 6-ft. lengths**



# NATCO Heavy Duty Hydraulic Drilling Machine with single spindle 7-speed geared head —

# —FOR TESTING DRILL LIFE

## FOR A PROMINENT DRILL MANUFACTURER




### Proof of Adaptability of NATCO Engineering

To help a well known drill manufacturer test the durability of his product NATCO produced a machine that would operate at peak efficiency under all abnormal or overload conditions. The motor on this machine maintains a synchronous speed up to the rated H. P. when drills become dull. A shear pin is provided to prevent destruction of gears in the head in the event of serious overloading. A range of 42 different speeds is provided thru change gears. The machine is heavy duty to give maximum rigidity to the column, head and spindle. As the load builds up to a predetermined value a torque limiting device operates to stop the motor.

Whether you have a special drilling, boring, tapping or facing problem or just a routine production problem involving these operations you will find it profitable to call a NATCO Field Engineer to help you. Write, phone or wire today for details on NATCO Machines that may assist you in obtaining more economical production.

*NATCO DRILLING, BORING, TAPPING AND FACING MACHINES*

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

*Branch Offices:* 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

*Call a Natco Field Engineer*

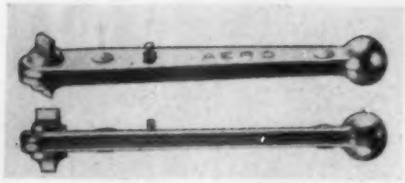
## Rotary Ball-Gaging Machine Offers Dual Sets of Gages

Koehler & Sons, Horsham, Pa., offers a rotary ball-gaging machine with dual sets of gages. No. 1 machine gages from 1/32-in. balls at a rate of 52,000 per hr. to ½-in. balls at 15,000 per hr. Change units consisting of 8 feed tubes and 6 conveyor plates and cones handle a range from 1/32 to ½ in. The No. 2 machine gages from ½- to ¾-in. balls at 5000 per hr.

Balls to be sorted are deposited in the circular hopper at the top. A revolving cone runs the balls into tubes and sets them up in a single line for each gaging block. As the ball moves down the tube it rests on the conveyor plate which turns at a rate of 3 rpm. The conveyor plates with slots carry the ball through the tapered gaging blade. As the ball reaches the opening in the blade its own size, it falls through into a small divided hopper.

## Lincoln Electrode for Depositing Machinable Welds in Cast Iron

The Lincoln Electric Co., Cleveland 1, Ohio, offers the Softweld electrode for depositing dense, soft, machinable welds in gray-iron castings. Softweld is a non-ferrous electrode and operates with a soft steady arc on either ac. or dc. Electrodes previously manufactured by Lincoln under the name Softweld have been discontinued. The entire weld area can be drilled, machined, sawed or tapped. The electrode is available in 14-in. lengths in ⅛-in. and 5/32-in. sizes, packaged in 10-lb. containers.

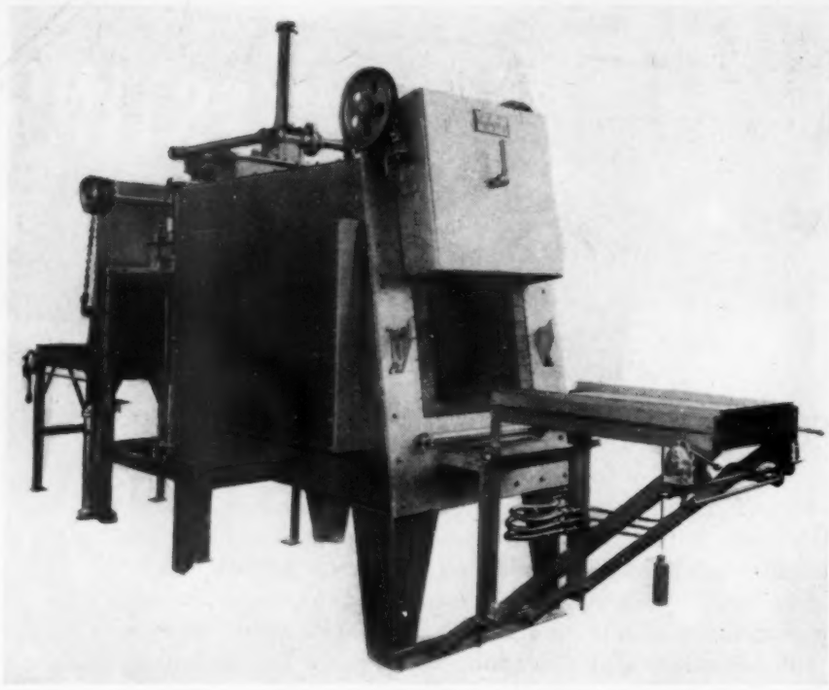


## Ratchet Screwdriver by Aero Tool Allows Leverage to Drive Screws

An offset ratchet screwdriver is offered by Aero Tool Co., 6930 Avalon Blvd., Los Angeles 3, Calif. Listed as the No. 5200 screwdriver, it is designed to permit the application of leverage to drive the screws, and to reach into areas that are not accessible ordinarily. The reversing lever makes the tool suitable to drive or remove screws. It has two blades; one for large and one for small screws, and a ball end grip to prevent injury to the hand.

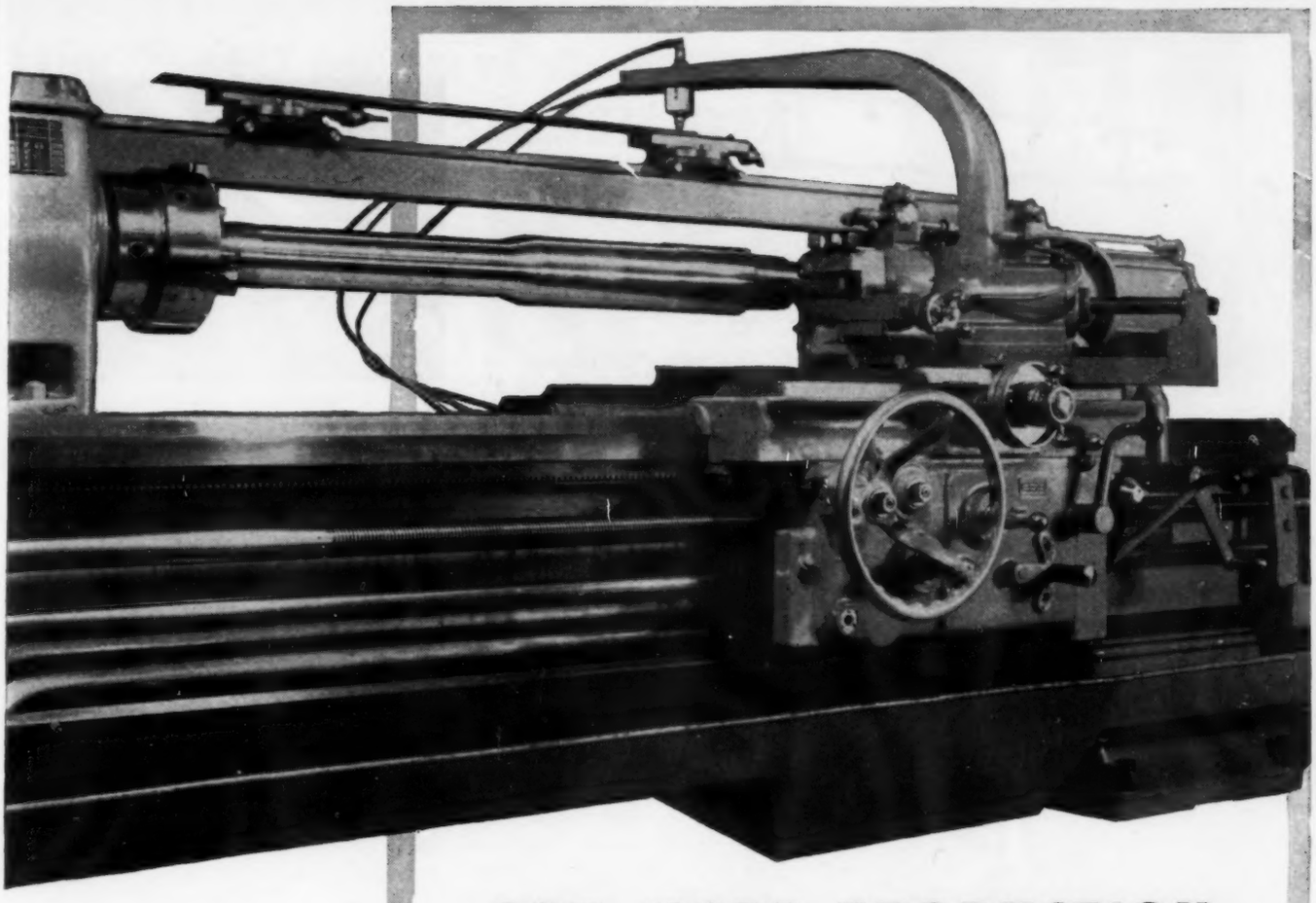
## Jernstedt Plater's Computer Gives Required Plating Time

The Hanson-Van Winkle-Munning Co., Matawan, N. J., offers the Jernstedt plater's computer which determines plating time required to deposit a given thickness of any metal. Also determined are: current density required to produce a deposit of given thickness, thickness of deposit resulting from an established plating time at a known current density, usual cathode efficiencies of all modern electroplating solutions, ampere minutes per square foot to deposit 0.0001 in. of all commonly used solutions at usual cathode efficiencies, and temperature conversion scale with degrees in Fahrenheit and centigrade. The computer measures 6¼x1½ in., comes in a vinyl carrying case, and is listed at $2. It resemles an engineer's slide rule.



## All-Purpose Atmosphere Furnace For Hardening High-Speed Steels

An all-purpose controlled atmosphere furnace is introduced by Lindberg Engineering Co., 2444 West Hubbard Street, Chicago 12, Ill. The furnace is suitable for hardening both high-speed and air-hardening steels. It is also used for brazing and sintering operations. Furnace will operate at temperatures to 2500 F. A propeller-type fan is built into the top part of the cooling chamber. Also offered is a Lindberg continuous-flow vibrating-hearth furnace, a controlled atmosphere unit, designed for hardening small parts. The vibrating of the hearth moves the work through the work chamber to a chute through which the parts fall into the quench. Parts flow by high-frequency vibration instead of hopping as a result of intermittent abrupt impulses. This furnace is built for temperatures to 1800 F., and is electrically heated.



# 30% MORE PRODUCTION ...14 LESS TOOLS

## *with Monarch Air-Gage Tracing*

Single-point stepless Air-Gage Tracing from a thin master template is saving 1½ hours production time per shaft on this job.

When turned on a conventional "automatic lathe" with fifteen cutting tools, only 14 shafts were machined in 8 hours. By the new Monarch method, rough turning takes a mere 11.45 minutes; finish turning, 11.08 minutes—and with a tolerance of .002". The former method required leaving .050" to .060" of grind stock; only .012" to .015" must be removed after machining on the Monarch. Furthermore, by the old method the pressure of 15 cutting tools belled out the work centers so badly that recentering was necessary before grinding—another operation saved by single-tool Air-Gage Tracing, the Monarch way.

Summarizing; savings are made in machining time, in grinding, in auxiliary operations and handling—and in set-up time, tool sharpening and tool investment. Even more important, the Monarch Air-Gage Tracer Lathe stands instantly available to make similar savings on *all production jobs* in the shop—changeover involves the mere substitution of the master template.

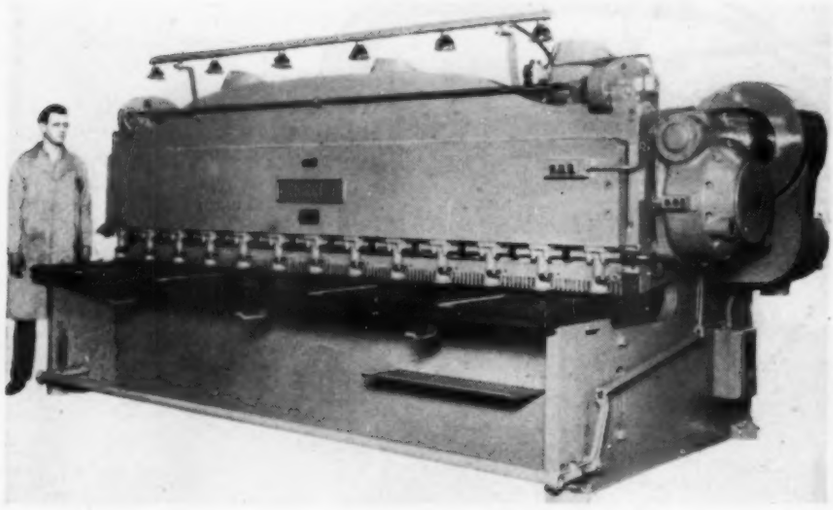
Does that kind of time-saving, money-saving "peak production at a profit" appeal to you? We'll be glad to furnish complete information on how Air-Gage Tracer-equipped Monarch Lathes can meet *your* metal turning requirements.

**THE MONARCH MACHINE TOOL CO.**
**SIDNEY, OHIO**

ACCURACY · ECONOMY · LONG LIFE

*Monarch* TURNING MACHINES

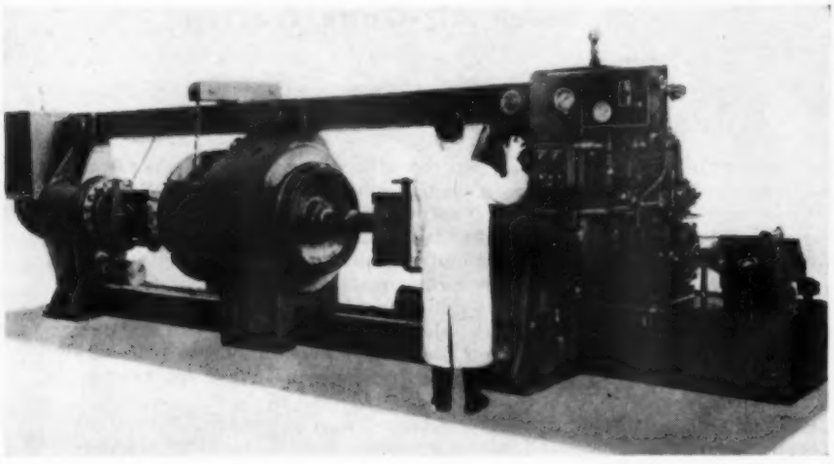
**FOR A GOOD TURN *FASTER*—TURN TO MONARCH**



## Cincinnati Shaper's All-Steel Shear Features a Low Rake to Upper Knife

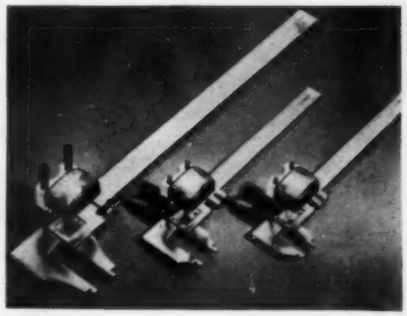
The Cincinnati Shaper Co., Cincinnati, Ohio, introduces an all-steel shear with a capacity of ¼ in. in mild steel 12 ft. long. A very low rake or shear angle to the upper knife is featured on this shear. The low rake insures the sheared strips with a minimum of twist bow or camber. The shears with the special low rake are said to be capable of shearing 10-gage strips ¼ in. wide and 10 ft. long without twist.

The shear will convert sheet stock to strips which are accurate and true for forming, punching, drawing and other operations. The Cincinnati light-beam shearing gage is offered on this machine for shearing to a scribed line in the production of gussets and other irregular shapes.



## Mounting and Demounting Press For Locomotive, Car Wheel Sets

The Watson-Stillman Co., Roselle, N. J., offers a production demounting press, capable of handling all types of wheel sets without the use of spacers. The new double-end machines, with 54-in. clearance between bars and a stroke at each end of 26 in., are available in 400- and 600-ton sizes. The press can be used to demount diesel wheels on a production basis without disturbing the drive gear. Single-station pushbutton controls are used. Rapid traverse is provided for idle portions of stroke.



## Magna Eye Magnifies the Vernier Scales on Calipers, Height Gages

Stebar Co., 711 W. Lake St., Minneapolis, Minn., offers the Magna Eye for magnifying vernier scales on calipers and height gages. The Magna Eye is made in three sizes to fit Brown & Sharpe and Starrett calipers and height gages. Model 100 is made for 6-in. vernier calipers, Model 200 for 10-in. height gages, and also 10-in. vernier calipers, and Model 300 for 18- and 24-in. height gages. The ground lens is movable horizontally to permit accurate reading on both sides of calipers for outside and inside readings.

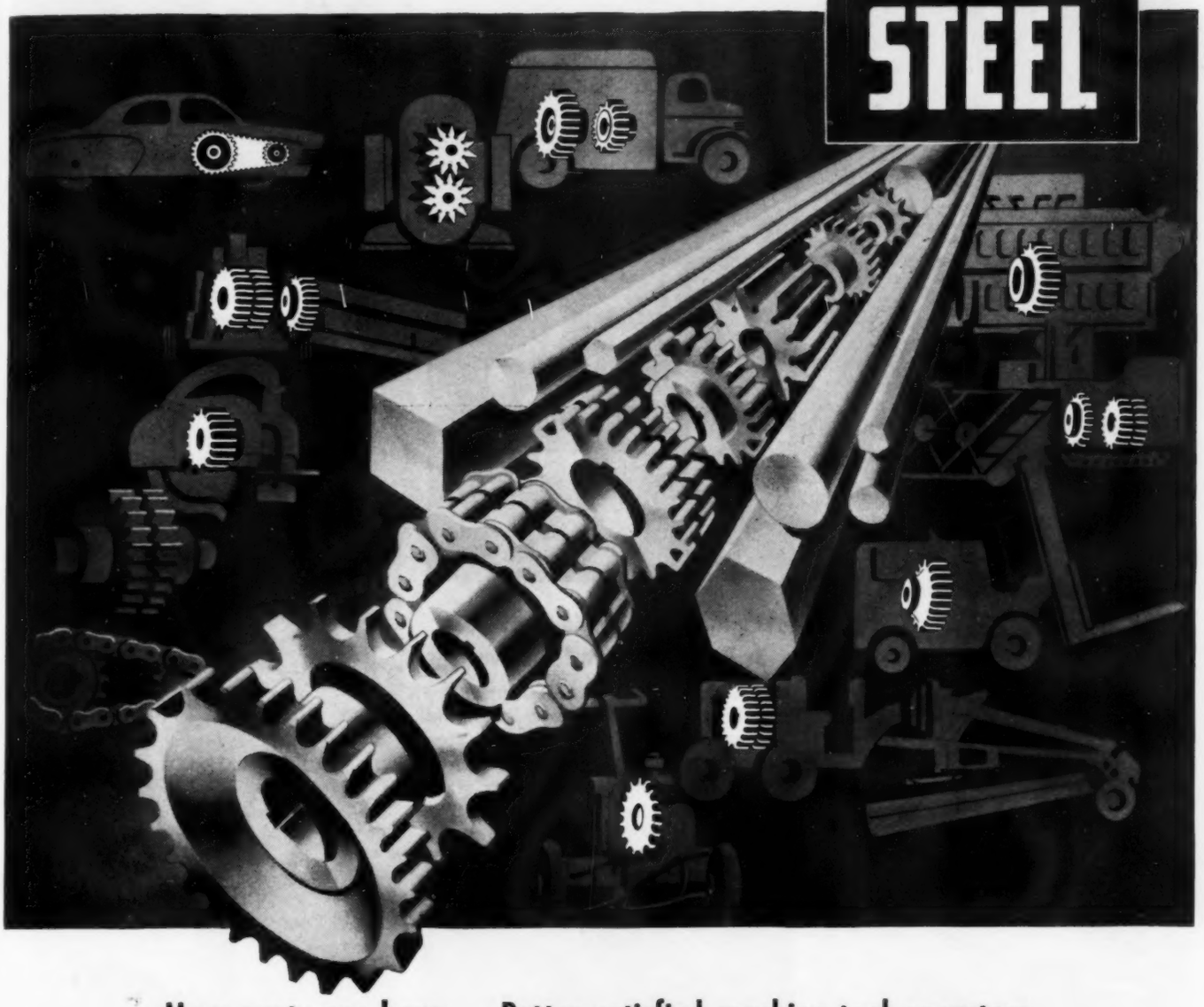
## Steel Shelving by Tri-State Assembles to Form Many Units

Tri-State Metal Products, Inc., Box 1513, Pittsburgh 30, Pa., offers steel shelving which can be assembled to form a variety of units. Basic parts consist of four posts with 36- or 24-in.-wide shelves either 12, 18, 24, or 36 in. deep. Posts are available in 87-, 84-, 48-, 45- and 39-in. heights. Ends and back panels of the necessary size can be provided for making closed shelving. Shelf dividers are also available.

**SQUARE STACKING BOX made by Palmer-Shile Co., 1609 Fullerton Ave., Detroit 27, Mich., is designed for handling miscellaneous parts. Box with on all-steel welded construction has a four-way entrance with a corrugated bottom**

**LINK-BELT** makes more and better sprockets
with **J&L JALCASE STEEL**

**J&L STEEL**



## More parts per hour . . . Better satisfied machine-tool operators with this original, free-machining, open-hearth steel

Link-Belt men like J&L Jalcase steel because it machines freely at high speeds, is easy to heat treat and the parts have a fine finish. They get more pieces per hour because Jalcase is uniform.

Their machinists particularly like Jalcase. They get higher production because of easier machinability, faster operation and extra long tool service.

Link-Belt is the world's largest manufacturer of conveyor and power transmission equipment—and a large producer of sprockets and chains used throughout all industry. Jalcase, because of its unique combination of free-machining and heat-treating properties, helps Link-Belt overcome the ever-increasing cost of production. This means:

- **Lower unit cost**
- **Finer finish on completed parts**
- **Higher physical properties**
- **Longer tool life**
- **Less down-time**
- **Less wear on machine tools**

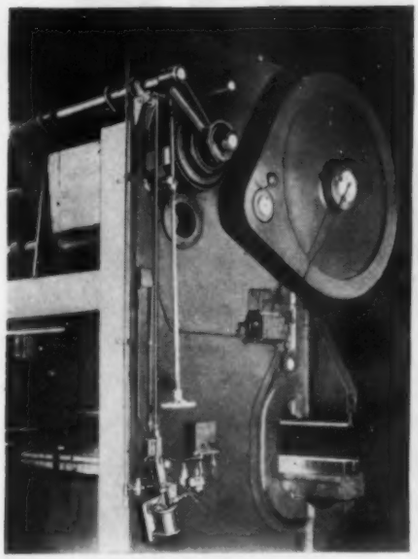
We should like to tell you more about JALCASE—the *original*, open hearth, free-machining steel. The coupon below is for your convenience.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Pennsylvania

Please send me complete data on JALCASE—the *original*, open hearth, free-machining steel.

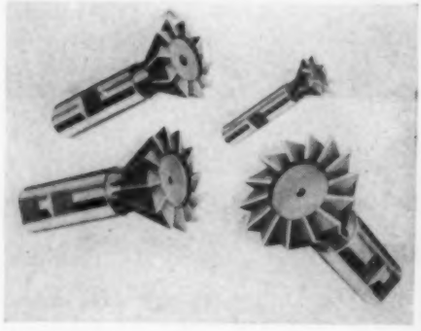
Name_____
Title_____
Address_____
City_____ State_____

**JONES & LAUGHLIN STEEL CORPORATION**



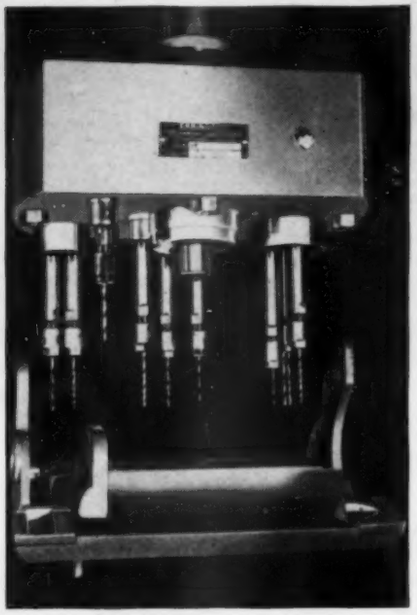
## Steelweld Presses by Cleveland Crane Offer Air-Electric Control

The Cleveland Crane and Engineering Co., Wickliffe, Ohio, have developed an air-electric control which is available as an optional feature on all Steelweld Presses. With this control an air cylinder throws in the clutch which is ordinarily done by a mechanical treadle. The air cylinder can be actuated by pushbutton or footswitch, or various combinations of both. A selector is usually incorporated in the circuit to provide various ram movements such as long or short stroke.



## Shank-Type Angular Cutters Cut Dovetails, Similar Work

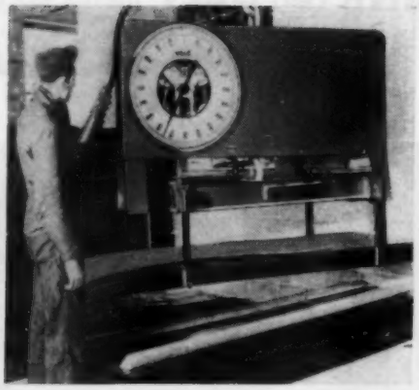
Shank-type angular cutters for use in welding end-mill holders are offered by the Weldon Tool Co., 3000 Woodhill Road, Cleveland 4, Ohio. Cutters can be used for cutting dovetails and similar work. Cutters can be used in collets as well as in the welder holder. They are finished in 60° angles and right-hand cuts. Also introduced is the tapered end mill of a constant-spiral design. Known as die-sinking cutters, their three-flute design with constant spiral insures free rapid cutting. They are regularly furnished with straight shanks for use in Weldon holders, or they can be used with draw-in collets.



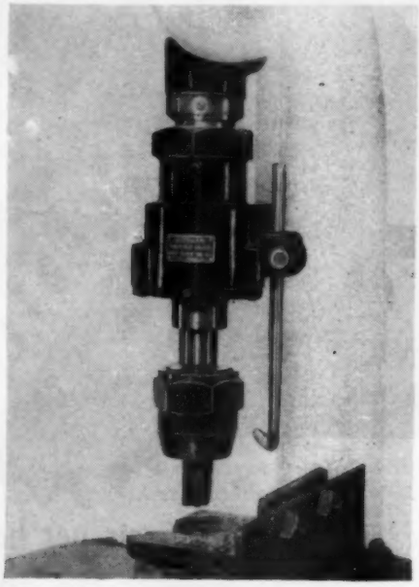
## Errington Ten-Spindle Drillhead Drills Holes on Varied Elevations

A 10-spindle multiple drilling head has been developed by Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y. The drillhead can be used for drilling ten different sized holes on various elevations. The head has grooved thrust ball bearings at all thrust points and hardened-bronze radial bearings.

**T-SQUARE** is a one-piece shatterproof plastic model. The clear plastic permits visibility of the surface on which the T-Square is placed. Both sides of the T-Square are equally usable. The ribs are protruded 0.20 in. above and below, enabling users drawing with ink to draw without smearing. The T-Square is available in two blade lengths, 18 and 24 in. It is made by the Instrumaster Industries, 2456-34 West Jackson Blvd., Chicago 12, Ill.



**FIVE-TON SCALE** for suspension between crane hook and load is offered by Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24, Pa. This set-up eliminates lost time and motion when rehandling loads before and after weighing. The illustration shows a 2¾-ton lift of 9-ft. block iron sheet being weighed as it is transferred from stockroom to production line

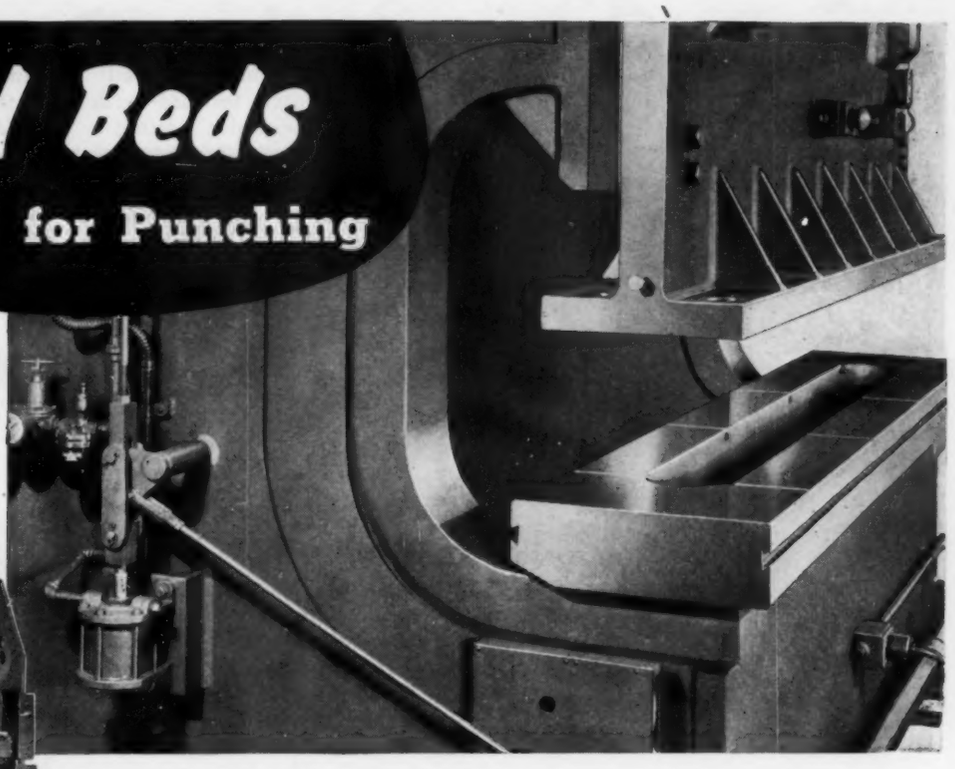


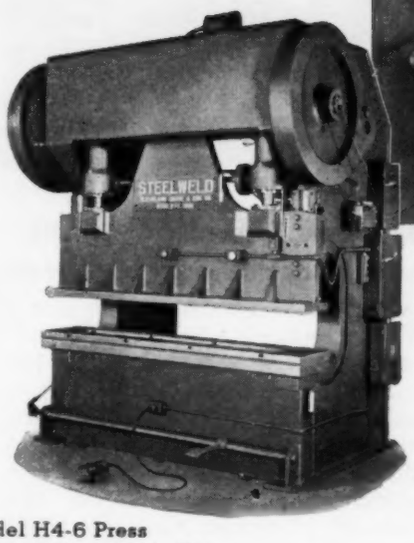
## Dorman Tapping Attachment Features Automatic Reverse

A heavy-duty automatic-reverse tapping attachment for ¾- to 2-in. pipe taps and standard hand or screw-machine taps, is offered by Dorman Machine Tool Works, South Mount Vernon, N. Y. The attachment is designed for back-geared drillpresses. It will drive and automatically reverse pipe taps of ¾ to 2 in., and the same capacity standard hand or machine taps.

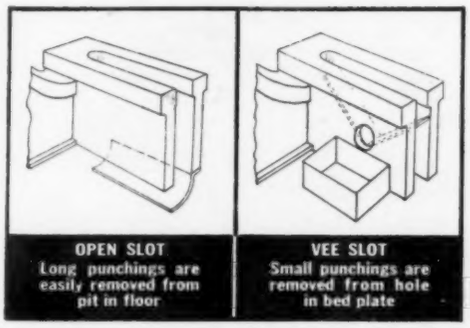
The tap holder is the collet type. The tapping attachment is said to be particularly suitable for long-run production tapping operations using larger taps.

# Slotted Beds for Punching






Model H4-6 Press with slotted bed. Handles plate to 6' 0" long between end housings. Operated by foot treadle or air-electric control.



**OPEN SLOT**
Long punchings are easily removed from pit in floor

**VEE SLOT**
Small punchings are removed from hole in bed plate

## *Converts Bending Press to Punch Press... and Cuts Costs as Much as 1/2*

Because Steelweld Presses adapted for punching often cost as little as one-half that of ordinary punch presses a number of companies have purchased them and effected real savings

Double-plate beds are usually employed with extra wide bed and ram to support the dies. In other respects the presses are standard. Machines have been built with beds as wide as 36", with slots in bed varying from 3" to 6¾" wide. The punchings drop between the bed plates (See sketches) and are easily removed from behind the machine.

The same presses used for punching can be used for bending and other forming operations. Steelweld Presses are built in all lengths to 20' 0" and in various capacities to 500 tons.

***GET THIS BOOK!***
CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

**THE CLEVELAND CRANE & ENGINEERING CO.**
*1412 EAST 281ST STREET • WICKLIFFE, OHIO*

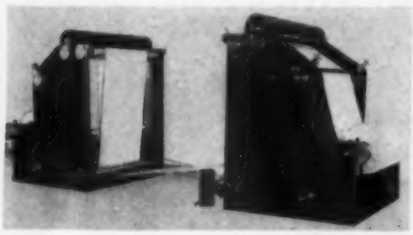
# STEELWELD
## *BENDING PRESSES*
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

## Stokes Dual-Pressure Preformer Gives Pressures from Top, Bottom

F. J. Stokes Machine Co., 5900 Tabor Road, Philadelphia, Pa., introduces the Model 294 dual-pressure preformer. Pressure is applied, using a floating die table, from both top and bottom simultaneously. The machine is said to produce preforms of uniform density throughout. Power-application is arranged so that the press cannot jam, or rest on dead center. Preforms are produced to 4 in. in diameter with a die fill of 2⅝ in. Irregular and rectangular pieces can be made up to 6 in. in length and 4 in. in width.

## GE Oven-Temperature Type Tester Checks Efficiency of Appliances

A portable oven-temperature tester for checking the performance and efficiency of heating appliances is offered by General Electric's Meter and Instrument Divisions, Schenectady 5, N. Y. Listed as Type DO-50, the instrument is a sensitive dc. millivoltmeter calibrated for use with iron copnic thermocouples, having a resistance of 2.0 ohms. The range of the scale is from zero to 650 F.



## Tension Unit for Web Processing Operates from 60 to 3200 fpm.

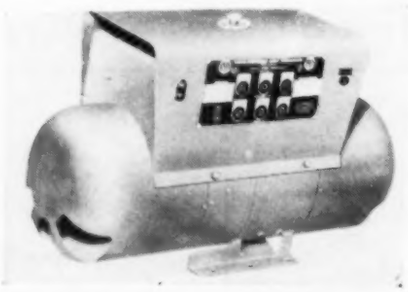
A tension unit for web processing provides constant tension and constant velocity on a web of paper during printing. Similar machines can be used in the paper, textile, plastic, leather and rubber industries and in the metal-fabricating field employing coiled strips of ferrous or non-ferrous materials. Machines will maintain constant tension over a wide range from a few ounces to hundreds of pounds. They have been built to operate at speeds as low as 60 and as high as 3200 fpm.

## Flexopress Automatic Press Cuts in Lengths to 9 in.

Ace Tool & Die Works, 129 E. McMicken Ave., Cincinnati 10, Ohio, offers the Flexopress, an automatic press for high-speed production of small parts. The machine offers a variable speed range from 150 to 600 rpm. and will cut production materials in uniform lengths to 9 in. The machine also will stamp and form small light parts such as clips, connectors and springs. It will perforate light metal, cloth, foil and similar materials. Production rates range from 9000 to 36,000 pieces per hr., depending on the material and type of work. The machine can be fed only by the automatic feed. Maximum length of feed is 9 in.; maximum width, 5 in.

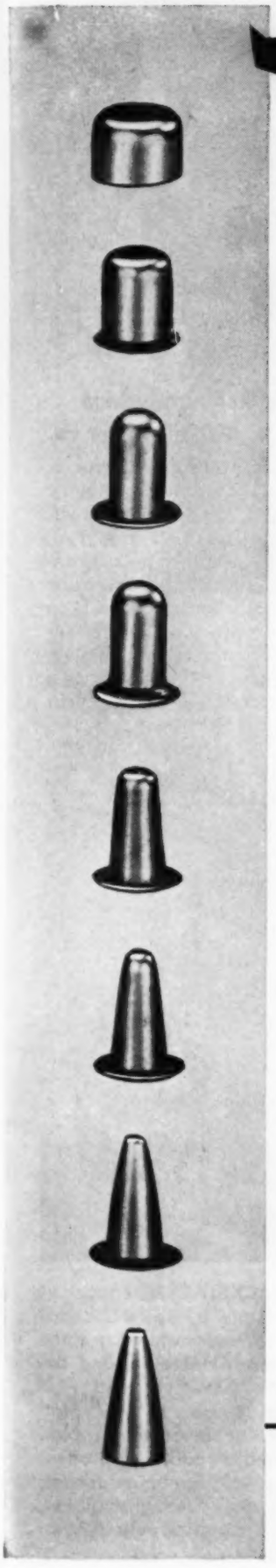
## Scale-Free Tempering Done with Steam Homo-Tempering Furnace

A steam homo-tempering furnace is offered by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., for scale-free tempering and strain relief of metal parts. High-speed-steel tools, cast iron, sintered powdered iron compacts, and non-ferrous alloys are being treated by this method at temperatures to 1150F. Steel parts are being completed with a uniform blue oxide finish.



ARC WELDERS made by Metal & Thermit Corp., 120 Broadway, New York 5, N. Y., are offered for ac. and dc. arc-welding applications. The ac. unit features include built-in power-factor corrector, stepless current control, and a wide current range. They are the transformer type available in 150-, 200-, 300-, 400-, and 500-amp. capacities. The dc. models feature a dial simplified-control panel, carrying a series of outlets, each one for an electrode of different diameter. Motor-driven dc. units are available in 150-, 200-, 300-, and 400-amp. capacities, in a 3600-rpm. model and in a conventional 1750-rpm. type

# Blanking...Cupping...or Drawing



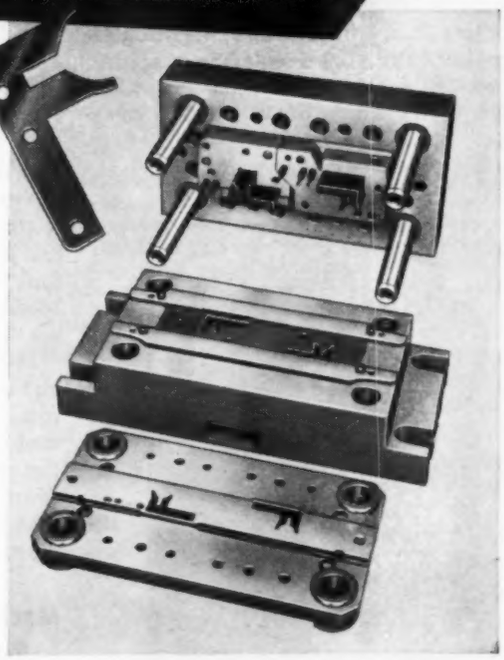
## SIMPLE...

● In this simple seven-draw operation, 600,000 Inconel pencil points were drawn before polishing the Carboloy dies.

In a second run, using stainless steel (18-8) .010 thick, 125,000 points have been drawn to date with no measurable effect on the Carboloy dies.

Two factors were responsible for the use of Carboloy in this operation: *no scratches could be tolerated* on the finished points, and a long run without polishing of the dies was desired.

## OR COMPLEX



**2,200,000** strokes were made on this die for blanking electric motor laminations, *on the first sharpening*. Steel dies averaged only 100,000 on each sharpening.

Whether you need simple Carboloy dies that you can make in your own shop or purchase from Carboloy, or complex dies like this Carboloy motor-lamination die available through many professional die shops, you will find that Carboloy gives you longer runs, better finishes, closer tolerances and lower costs.

**A Carboloy engineer** will gladly call on you at any time to help you with any problem. Send for the Carboloy DIE ENGINEERING MANUAL, D-124, to find out more about the advantages Carboloy Cemented Carbide can give you. Carboloy Company, Inc., 11149 E. 8 Mile Road, Detroit 32, Mich.

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CEMENTED CARBIDE

## Mechanical Vibration Measured And Recorded by GE Vibrometer

A recording vibrometer which measures and records frequency displacement and wave shape of mechanical vibration is introduced by General Electric's Special Products Div., Schenectady 5, N. Y. The vibrometer can be mounted on a fixed base or held in the hand. It weighs 7 lb. and is less than 8 in. in length. Testing of reciprocating, and rotating machinery can be done within a vibration frequency range of 10 to 120 cycles per sec. A continuous-strip chart gives a permanent record of the test.

## Projection Welder by Acme Designed for Light Work

A projection welder for speedy operation on light jobs, listed as Type PT-O, is an air-operated, press-type, direct-action projection-welding machine, supplied in either 20, 30 or 40 kva. Made by Acme Electric Welder Co., 2618 Fruitland Rd., Los Angeles 11, Calif., the machine can be converted to a conventional spot-welder by the use of a horn adapter and horn. Standard throat length is 6 in.

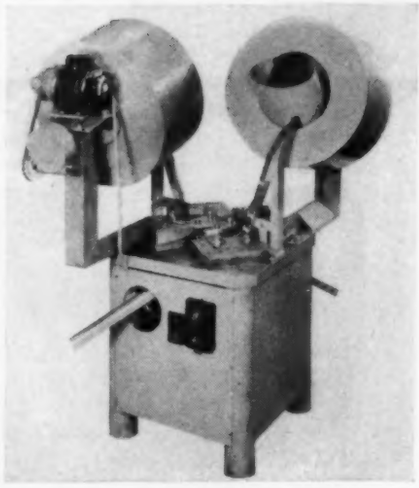
## Grimes Vertical Air Compressor Designed for Saving of Space

The Grimes Co., Dallas, Texas, offers a vertical air compressor designed with the tank upright and the motor and air-compressor unit mounted on top. Three models are offered. The Model 25-V has a 20-gal. tank with a 1½-cfm. air displacement.

Model 50-V has a 30-gal. tank and displaces 2.7 cu. ft. of air per min. The Model 75-V has a 30-gal. tank and displaces 4.07 cu. ft. of air per min. The Model 25-V requires a 20-in. diameter floor space and the other two models require a 24-in. diameter space.

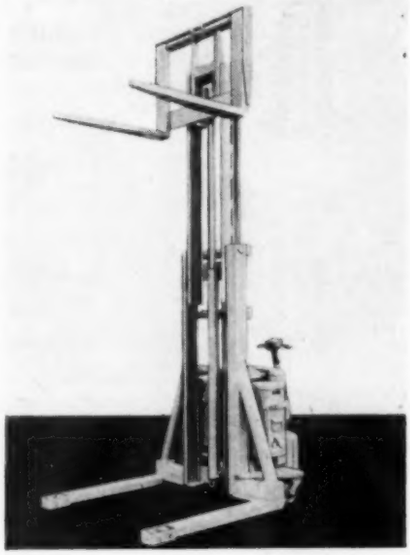
## Machinable Welds on Cast Iron Made with Nickelcast Electrode

The Hobart Bros Co., Hobart Square, Troy, Ohio, offers the Hobart Nickelcast electrode, a 100% nickel electrode for producing machinable welds on cast iron without preheating the metal. Welds are machinable and can be drilled, tapped, or machined at any point in the weld zone. Coating is insulated to prevent arcing through when working in confined quarters. The electrodes can be used with either ac. or dc. and are available in 3/32-, ⅛-, 5/32-, and 3/16-in. diameter sizes.



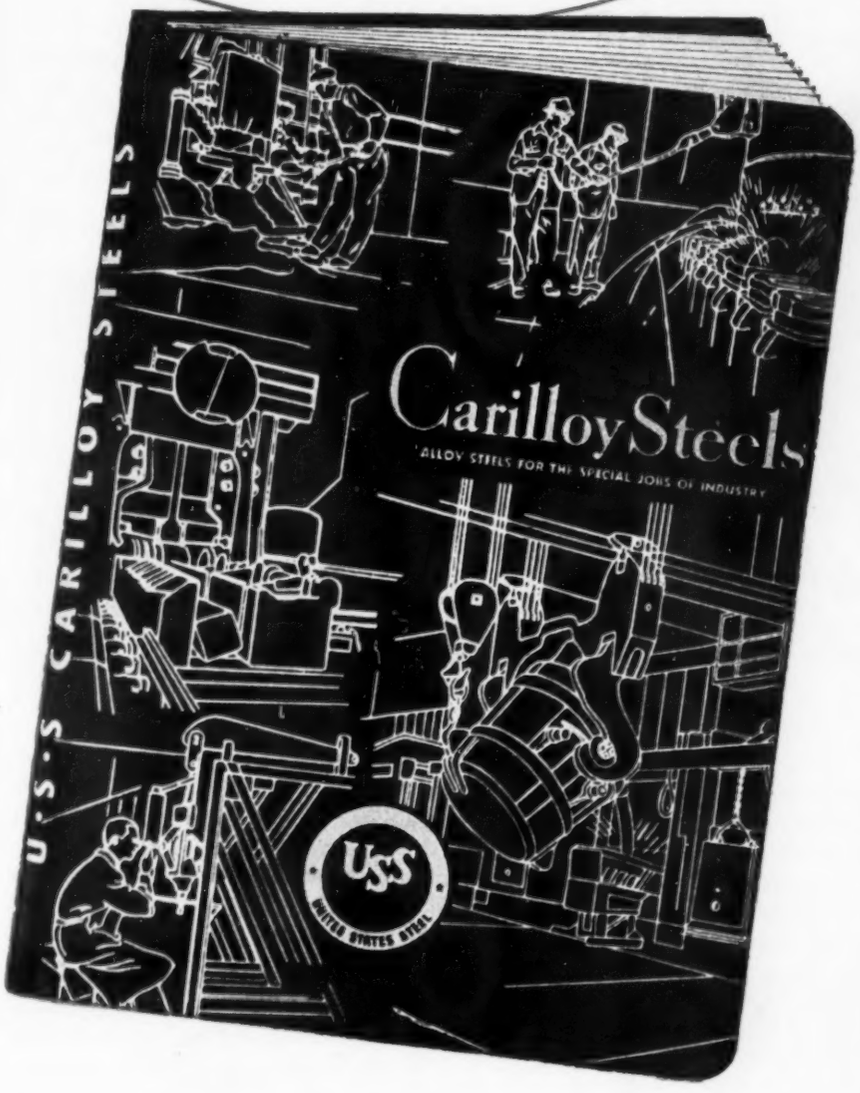
## Rotary Thread-Rolling Machine Handles to 20,000 pieces per Hr.

A rotary thread-rolling machine is offered by D. H. Prutton Machinery & Tool Co., 5295 West 130th Street, Cleveland, Ohio. Listed as the Rollmaster, no motion is lost by reciprocation movements. Bolts and studs of various descriptions to ¼ in. in diameter can be run through threading, ribbing, knurling, marking, necking, and similar operations at a rate between 15,000 and 20,000 pieces per hr.



TELESCOPIC JACKSTACKER, capacities to 4000 lb. Made by Lewis-Shepard Products, Inc., Watertown, Mass., the truck is electrically operated, and designed for the movement and high stacking of materials on skid platforms, pallets, or in sectional bins. Counterweighted, straddle-type, open-end base, and platform-type models are available for handling single- or double-faced pallets as well as skids or platform-type containers

# A NEW BOOK *to help you use alloy steels more efficiently*

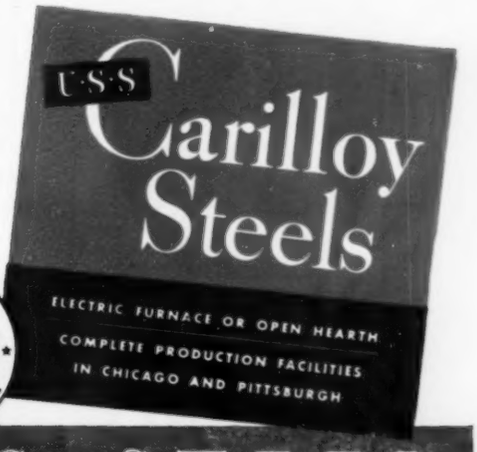



● Here are 176 pages packed with practical information that will make the selection, heat-treatment and application of alloy steel easier and simpler.

In this book are clearly and simply described the facts it will pay you to know about today's alloy steels. For example:

- **How alloying elements affect the microstructure and properties of steel—depicted as Isothermal Transformation Diagrams (S-curves).**
- **Correlation of Isothermal Transformation Diagrams and Continuous Cooling Diagrams with end-quench hardenability test data.**
- **The use of H-Steel hardenability bands and hardenability conversion charts for determining the proper selection of steels to meet various requirements.**
- **How to calculate hardenability from chemical composition and grain size when test data is lacking.**
- **Mechanical properties of the more commonly used alloy steels.**
- **Properties of various alloy steels at elevated temperatures as regards tensile strength, creep strength and rupture strength.**
- **Practical heat treatment based on "S"-curve information; also up-to-the-minute data on normalizing, annealing, quenching and tempering, on Austempering, Martempering and U·S·S Improved Heat Treatment.**
- **Quick-reference charts covering principal applications of constructional alloy steels in various industries; also tables of useful information including critical temperatures—functions of the steel making elements—latest list of A.I.S.I. — S.A.E. standard constructional alloy steels.**

**This book is free.** If you have not already received a copy, simply write us on your company letterhead, and we will forward one to you. (Please indicate your official connection). For prompt reply, address —Carnegie Illinois Steel Corporation, Room 2018-B Carnegie Building, Pittsburgh, Pa.

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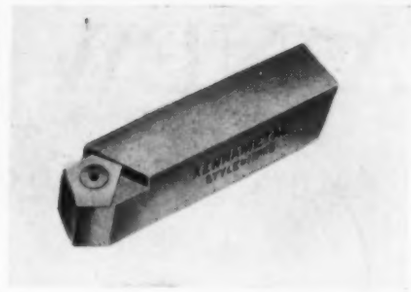

SMALL TOOLS having mechanically held tips are offered by Kennametal Inc., Latrobe, Pa. Tools have shanks ½, ⅝, ¾, and 1 in. square. Listed as Kendex tools, they feature a flat tip that is held to a steel shank with a countersunk flat-head cap screw and socket nut. Tips are made in four different shapes: square, round, triangular, and pentagonal

AC. WELDER known as the Sureweld is made by the National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill. The welder is available in 12 models; seven for high-speed heavy-duty fabrication, and five for machine shops, welding shops, and light-production work. A four-coil transformer with movable magnetic shunt is said to assure good welding characteristics at every point within the range. High potential secondary circuits give dielectric strength tested to withstand 7000 v.

### Minnesota Mining Contact Wheel For Heavy Grinding with Belts

The Minnesota Mining and Manufacturing Co., St. Paul, Minn., offers a contact wheel designed for heavy grinding with abrasive belts at speeds of 10,000 sfpm. or more. Called the "K" contact wheel, it is

# How welding simplifies the design of brackets

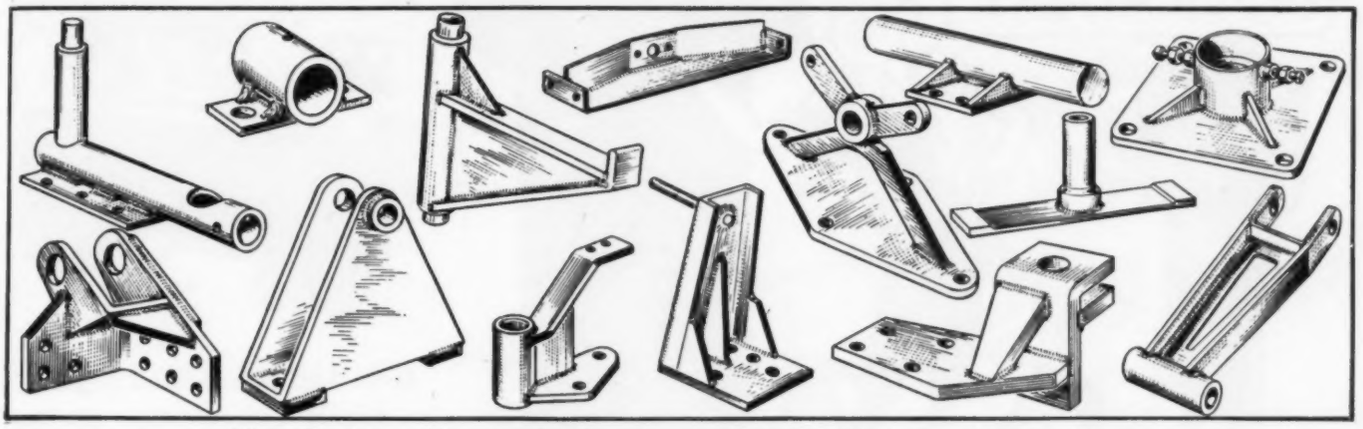

Fig. 1. Typical machinery brackets for various applications *built at lower cost with arc welding.*

WELDING builds all types of component parts, like the brackets shown in Fig. 1 . . . stronger and with less material. Here are several suggestions for building better brackets at lower cost:

Simplest in design are the brackets shown in Fig. 2, made either from separate members or from a single piece sheared and form-bent. For greater rigidity, the cantilever arm can be built from an "I" section (Fig. 3). Two or more of these "I" sections may be placed side by side and butt welded.

Heavy loads are carried with the channel construction shown in Fig. 4. For rigidity and light-weight construction, steel tubing is form-bent and welded to the supporting member (Fig. 5). With tube design, less welding is required.

Improved product appearance and high product strength are combined by using totally enclosed box-type construction (Fig. 6). Individual parts are fabricated from standard mill shapes or are cut from steel plate.

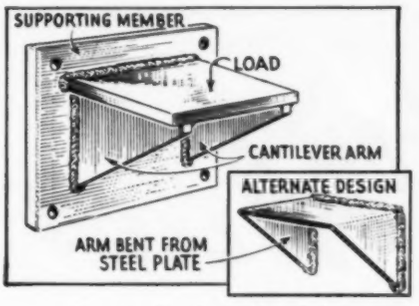


Fig. 2. *Simple bracket design* for normal loading.

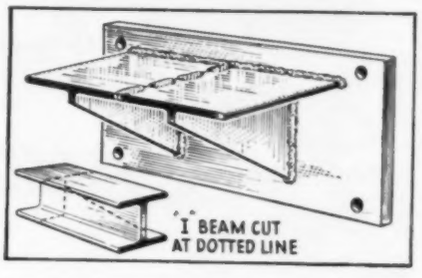


Fig. 3. *Alternate welded design* for low-cost construction. Standard "I" beams are cut and fillet welded to supporting member.

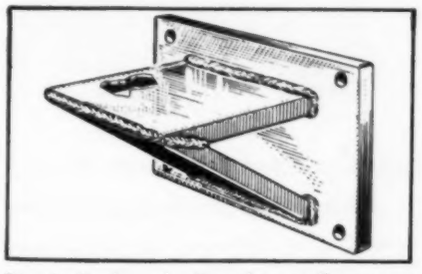

Fig. 4. *For heavy loading*, the cantilever arm is made from channels flame-cut to shape and welded.

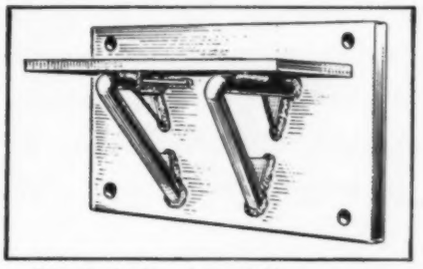

Fig. 5. *Light-weight, rigid construction* uses tubing.

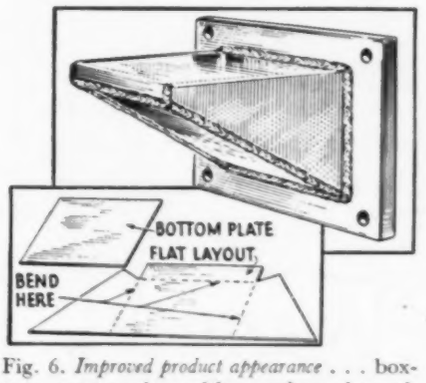


Fig. 6. *Improved product appearance* . . . box-type construction with members sheared, bent to form and welded.

More detailed data on the design of brackets for arc welding is contained in the "Procedure Handbook of Arc Welding Design and Practice." Price $1.50 postpaid in the U. S. A.; elsewhere $2.00.

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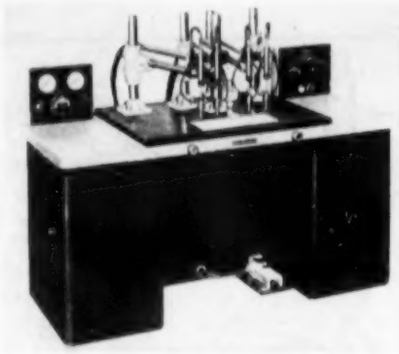
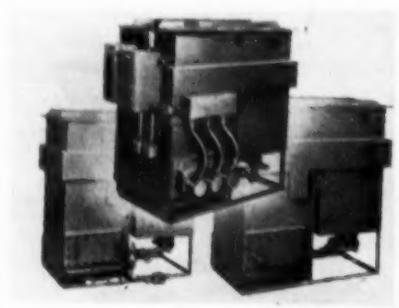
made in 8- and 16-in. diameters in face widths of 2, 3, 4 and 6 in. It is designed for use with cross belts coated with silicon-carbide or aluminum-oxide mineral grains. Reduction of grinding heat is claimed.



### Short Arc Time on Stud Welder Allows Concentration of Heat

A capacitor-operator self-timed welder using tip studs is offered by Graham Mfg. Corp., 1643 National Bank Bldg., Detroit 26, Mich. Tip studs, on coming in contact with the work and fusing, causes ionization which allows a path for the main discharge current of the capacitor to form an arc sufficient to melt both the diameter of the stud and the workpiece. The time of the arc is about one mil second allowing use of very high currents. The short arc time permits concentration of heat, and welding of studs on very thin metal. No flux is necessary.



### Hand-Operated Degreaser Offered With Quick-Conversion Heating

Detrex Corp., Detroit 32, Mich., announces the No. 625 degreaser, a two-dip hand-operated unit for cleaning of medium-size metal parts. The unit can be heated by steam, gas or electricity. It can also be furnished with combined gas and steam or gas and electric heating.

The construction of the main body is standardized so that it can be converted from one type of heating to another. The unit will immersion-clean parts that fit into a space

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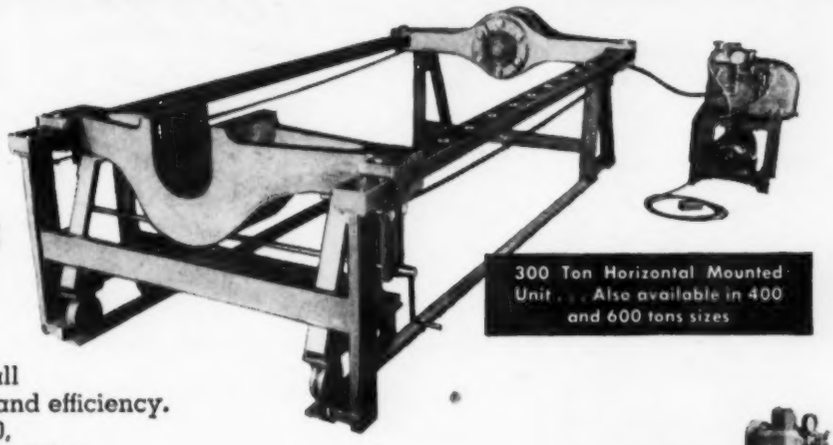

300 Ton Horizontal Mounted Unit . . . Also available in 400 and 600 tons sizes

Here is your practical answer to those many heavy forcing jobs — a versatile Rodgers Forcing Press with all the features of operating convenience and efficiency.

The stationary model comes in 300, 400 and 600 tons sizes, with either horizontal or 75° inclined mounting; a portable model is available in 100 or 200 tons capacities. Hydraulic power is supplied with either hand or power-driven pumps. Remote controls on power-driven pumps permit operator to stay close to the work, assuring accuracy of the job.

Each Rodgers press is designed and constructed for convenience in assembling and disassembling as well as operation. Head member, yoke abutment and hydraulic pump are independent units easily assembled where needed.

The Rodgers Portable with horizontal frame mounting . . . Made in 100 and 200 tons capacities

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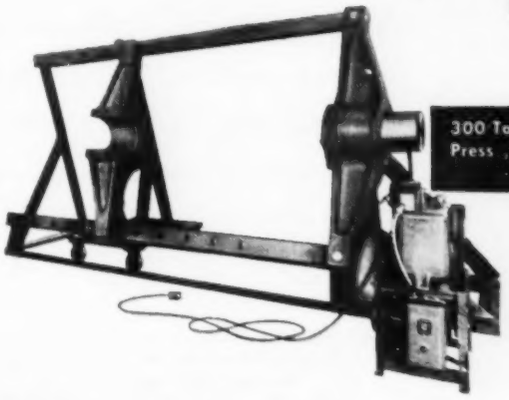
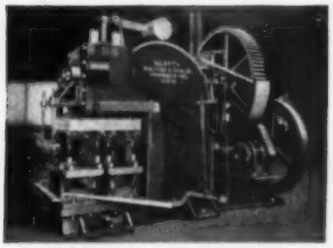
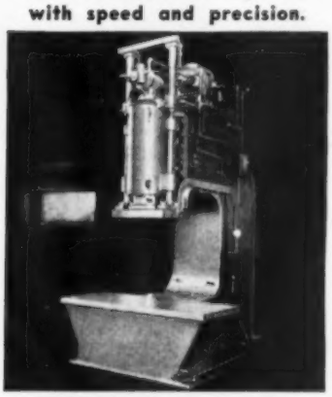


300 Ton, 75° Incline Mounted Press . . . Also in 400 and 600 tons

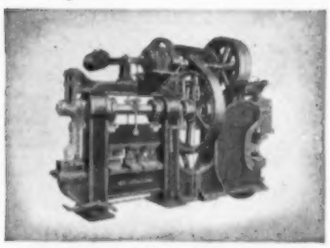


BEATTY No. 11-B Heavy Duty Punch widely used in railroad industry.

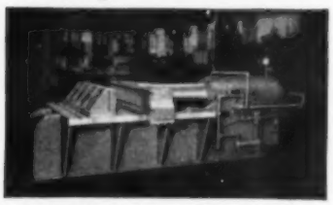
BEATTY Spacing Table handles beams, channels, plates with speed and precision.



BEATTY 250-Ton Gap Type Press for forming, bending, flanging, pressing.



BEATTY CoPunShear, one unit does coping, punching, shearing.



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

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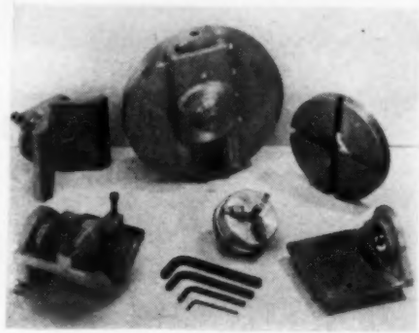
A BEATTY machine is tailor-made to do a certain job — and do it better, in less time, at less cost. Our long and varied experience in solving metal working problems enables our engineers to grasp your problem quickly, and provide a practical, proven answer. AND we can offer you real economy, too, because the range of BEATTY machines is so wide that with minor changes and careful tooling we can often provide a tailor-made machine at little more than the cost of a standard model. Let us work with your own engineers on your next production problem. Two heads are better than one, especially when they're looking for the same thing — *a better way to do it.*

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

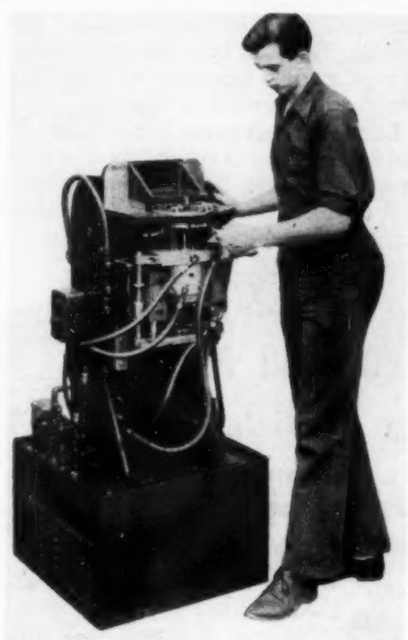
BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA


18x21x12 in., and shafts up to 4 in. in length can be cleaned by suspending them in the vapor zone. Floor space required is about 10 sq. ft.



### Faceplate, Attachments Convert A Lathe Into a Milling Machine

A multi-purpose faceplate and attachment are offered by Superior Mfg. Co., 1302 Ontario St., Cleveland 3, Ohio, for conversion of a lathe into a milling machine, boring machine, or drillpress. Regular or odd shapes and sizes can be handled. Bar stock or castings can be drilled, bored, milled or ground. Operations at any radial or angular relation to each other can be done without moving the work from its original position in a fixture.



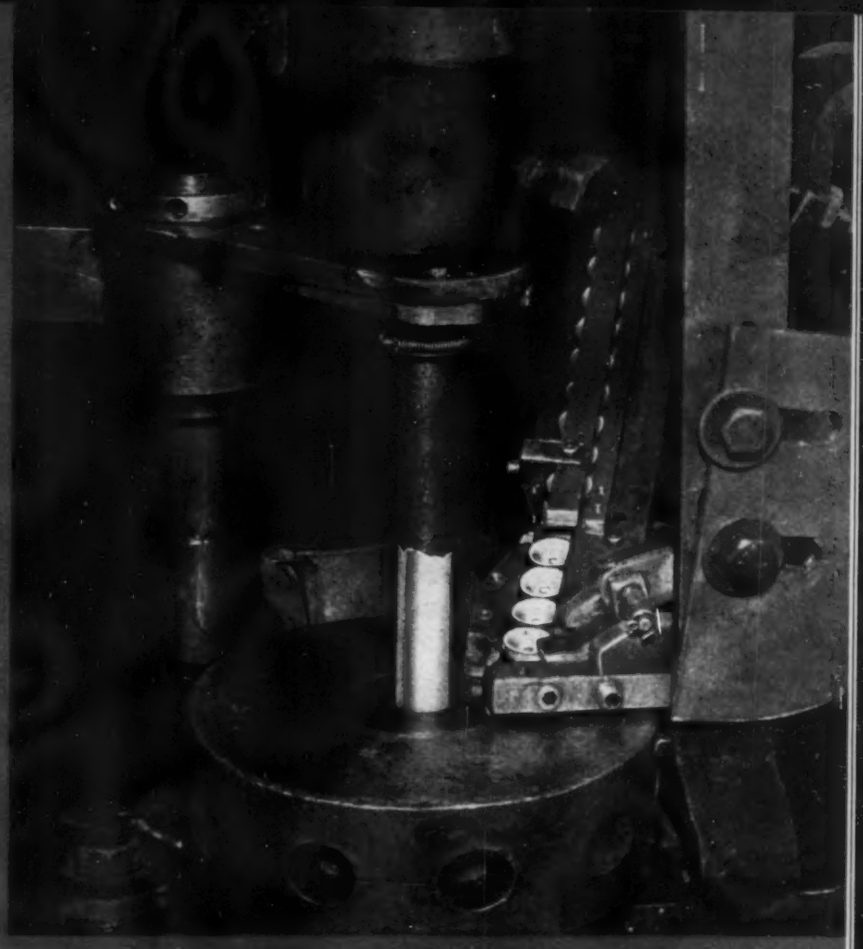
### Zagar Special-Purpose Machine Drills Holes from Underneath

A special-purpose machine is offered by Zagar Tool Inc., 23880 Lakeland Blvd., Cleveland 23, Ohio, for drilling holes from underneath. Holes are drilled in this manner for the purpose of clearing out chips. Two hy-

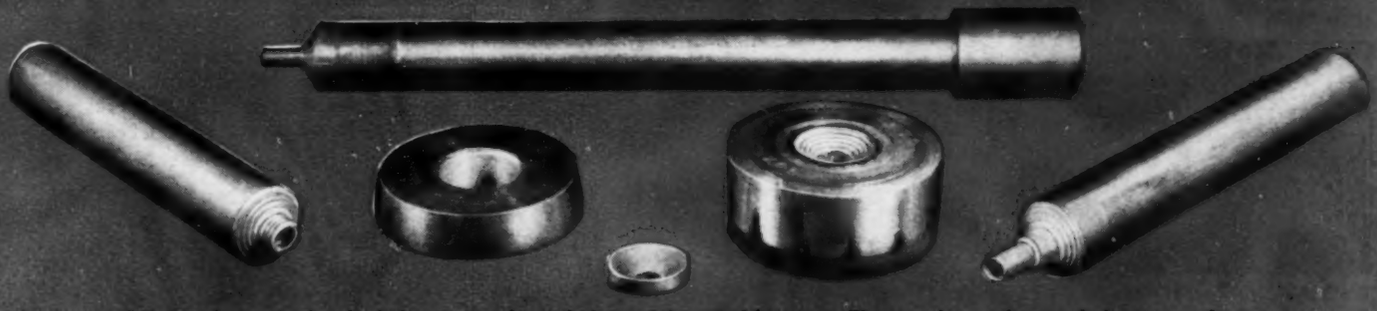
# *Impact Extrusion*

with

# BETHLEHEM TOOL STEELS



Extruding toothpaste tubes at Victor Industries with Bethlehem tool steel. The lubricated slugs are subjected to pressures from 50 to 300 tons in this extrusion press. As the punch is driven downward on the slug resting in the die, the aluminum flows up the punch to form the tube shape.



At left is shown the finished aluminum tube with the end threaded for a cap. The punch is at the top; below it are the upper and lower dies with the aluminum slug between them. At the right is shown the tube before the tip is cut off.

Dependable tool steel is essential for impact extrusion jobs. Victor Industries Corp. of California at Chico, Calif., uses Bethlehem tool steels exclusively and reports fine performance. This plant is the first of its kind to go into production on the West Coast, converting aluminum slugs into squeezable tubes for toothpaste, shaving cream, glue, grease, and other items.

The dies are machined to accurate contour from Bethlehem XX Carbon Tool Steel. This is a general-purpose, water-hardening grade that provides a hard surface for wear-resistance, reinforced by a tough core to withstand the continuous heavy pounding and side pressure exerted on the dies.

The punches are made from Lehigh H, a high-carbon, high-chromium grade that is air-hardening for maximum safety in quenching. In addition, it provides the minimum of distortion during heat-treatment and has extremely high wear resistance.

These and other fine Bethlehem tool steels are carefully made in our modern tool steel mill. There are tool and die grades, shock steels, hot-work and high-speed steels. You can get prompt shipment and practical assistance by consulting with the nearest Bethlehem sales office or tool steel distributor.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

*Export Distributor:*
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

## BETHLEHEM TOOL STEELS for EVERY JOB

# SAVE THESE 8 WAYS WITH LAMINUM* SHIMS!

LAMINUM shims are laminated shim brass or steel built into a "solid", unit structure by an exclusive process.

Simply p-e-e-l for your adjustments. No machining, filing or grinding required for accurate factory assembly or service adjustments.

The remaining "solid" shim is always uniform in gauge, with a hard surface ... clean and smooth as glass.

1 Assembly time reduced up to 30%. No precision machining, grinding, filing, miking.

2 All adjustments made at the job by peeling laminations. No standby lathe.

3 No fumbling and counting loose, paper-thin wafers.

4 Less compressible than ordinary one-piece or stacked shims.

5 Cut to your exact specifications. Less than 1% rejects over the years.

6 Can be fitted with babbitted lugs to prevent oil and pressure loss.

7 No new skill required for use.

8 Your customer recognizes the plus value of less "down time" for maintenance and adjustment.

***Send today*** for chart illustrating 46 money-saving, time-saving applications, detailed specifications, sample of LAMINUM.

**PRECISION STAMPINGS in any quantity**

Let us quote on your *difficult* stamping jobs. Our experience, tools and presses are geared for *close tolerance* production.

* LAMINUM (Reg. U. S. Pat. Off.) shims are solidly bonded laminations of .002 or .003 inch precision gauge brass or steel with a microscopic layer of metallic binder. Cut to your exact specifications.

LAMINUM

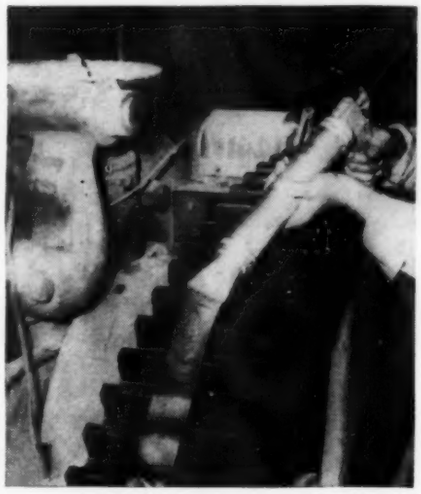
THE SOLID SHIM THAT peels FOR ADJUSTMENT

**LAMINATED SHIM COMPANY, Inc.**

3111 Union Street Glenbrook, Conn.

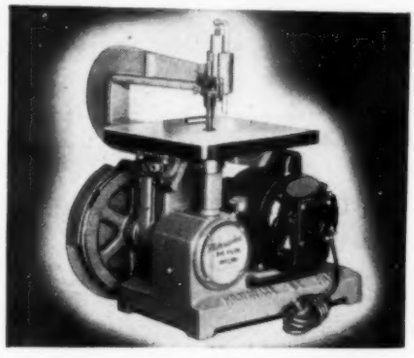
SHIMS SHIM STOCK STAMPINGS AN-COR-LOX NUTS


draulic cylinders are located on each side of a Zagar gearless drillhead. Cylinders act as the feed mechanism for the head. A fast approach and fast return are featured. Machine is self-contained and requires no outside connections with the exception of the electric power.



## Gun Method of Application Offered For Heavy Lubricant on Open Gears

Keystone Lubricating Co., 2106 Lippincott St., Philadelphia 34, Pa., offers a heavy lubricant for open gears under extreme service conditions. Listed as the Keystone Grease No. 32, the lubricant is said to be effective through a wide range of temperatures. It is packed in leak-proof paper cartridges which fit in a specially designed gun applicator. The grease is fed through the nozzle in a broad ribbon which assures its reaching the pressure side of gear teeth.



## Model FS Milwaukee Die Filer Offers an All-Purpose Overarm

A bench-type reciprocal filing machine, Model FS is offered by Rice Pump & Machine Co., Milwaukee, Wis. The Milwaukee die filer performs all three die-making operations: filing, sawing and lapping, without changing overarms. A deep-throated all-purpose overarm

# This "metal-hog" *laughs* at heat!

## *Why the new . . .*

## RESINALL METALITE® BELT cuts faster, longer

IN HOGGING OFF BIG CHIPS with a dry grinding backstand belt — or anything else — the tough factor is *heat*. Here's the belt to beat it — the new RESINALL METALITE belt, with its heat-defying thermosetting resin bond, plus Behr-Manning Durabonding. This combination double-locks every chip-gouging grain rigidly in place with its enduring cutting edge at the true cutting angle, and holds it there in spite of the incandescent heat of heavy stock removal.

You get higher production three ways — sustained sharp cutting because the grains stand up to their work . . . freedom from undue loading because the non-softening bond will not fill with the chips . . . and far less downtime for belt changes, because this new belt gives you *2 to 4 times greater belt mileage*. Why not check on it?

### *GET A FREE DEMONSTRATION*

See the new Resinall Metalite belt do its stuff in your own shop on your own work. Just mail the coupon.

**BEHR-MANNING · TROY, N. Y.**
(DIVISION OF NORTON COMPANY)

BEHR-MANNING, TROY, N. Y.

We'd like to see what your new RESINALL belt can do on our work.

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

**A Multi-Fluted Tap specifically designed to tap in all PLASTIC materials successfully**

## HERE'S HOW HY-PRO DID IT

**PART:** Molded Plastic Electronic Control Base.

**PROBLEM:** Develop a tap, for tapping special plastic electronic control base, that will hold thread size and have an average life of better than 500 pieces per sharpening.

**HY-PRO SOLUTION:** Hy-Pro Tap Engineers tested the material, then designed a NEW multi-fluted tap to meet specifically the job requirements. Comparative tests with available competitive taps produced these results: 135 pieces per best available tap to 3200 pieces per Hy-Pro Plastics Tap.

Continued experience with leading makers of plastic parts has proved that this design will produce better results than any other tap, in any plastic.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

*Order from your distributor.*

HY-PRO TAPS

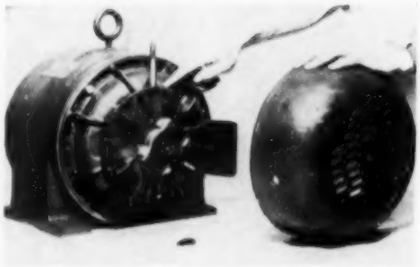
**HY-PRO TOOL CO.**

NEW BEDFORD, MASSACHUSETTS

A SUBSIDIARY OF CONTINENTAL SCREW COMPANY


equipped with an upper chuck in the overarm assembly makes it possible to chuck files, saws or lapping sticks at the upper as well as the lower end. Overarm also permits chucking close to the work.

# Parts and Materials



### Totally Inclosed Motors by GE Offer Corrosion-Resistant Fan

The Textolite corrosion-resistant fan is now offered as standard equipment on the GE totally inclosed motors. Offered by General Electric, Schenectady 5, N. Y., the GE Tri-Clad totally inclosed fan-cooled motors are available in popular sizes from one to 20 hp. Fan is non-sparking.

### Fairbanks-Morse Motorgears Offer Axial Air-Gap Motor

A line of motor gears is offered by Fairbanks-Morse & Co., Chicago 5, Ill. The motorgear with an axial air-gap motor is available in ratings from ¾ to 10 hp. Units are symmetrical in design with no separate right-hand or left-hand assemblies. Motor can be removed from the gear housing and run separately. It is said to be less than half the size of the conventional-type motor.

# CAN YOU BEAT IT?

## 10 SECONDS to cut 2 1/2" Electric Cast Steel

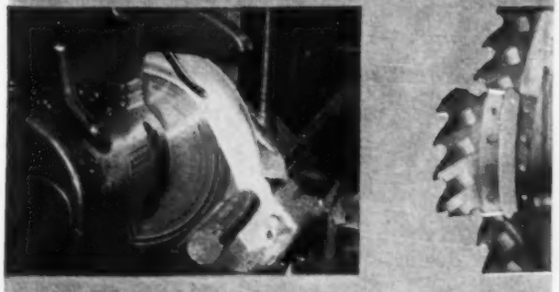
## ATKINS "Curled Chip" MILLING SAWS

To be sure milling saw performance like this — reported by one Atkins user — is outstanding, even for an Atkins. But it does show why it will pay you to take a long, careful look at your own cutting operations.

It's easy to see why the Atkins "Curled-Chip" Method of metal cutting so often results in sensational reductions in cutting costs. Where the conventional angular tooth must push against a vertical face, the inward-curving Atkins "Curled-Chip" Tooth gets *under* the chip and *lifts* it in a continuous clockspring-like coil. Result: less tooth-dulling heat — faster cutting speeds — heavier feeds — cleaner, truer cuts that need less re-machining.

To find out just what this can mean to you, check with your distributor today. Ask him to have an Atkins Cutting Engineer arrange a demonstration on any work you choose.

ATKINS "CURLED-CHIP" SEGMENTAL SAW



Engineered to increase cutting under the toughest demands of heavy-duty sawing machines. "Curled-Chip" teeth in segments permit consistently narrower cutting width. Worn-out teeth can be quickly replaced without discarding the saw disc.

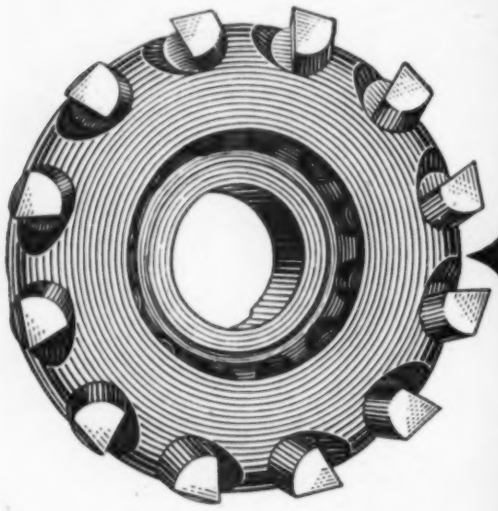
ATKINS "Silver Steel" SAWS

E. C. ATKINS AND COMPANY • *Home Office and Factory:* 402 S. Illinois Street, Indianapolis 9, Indiana
*Branch Factory:* Portland, Oregon • *Branch Offices:* Atlanta • Chicago • New Orleans • New York • San Francisco

AAA TRADE MARK ATKINS "ATKINS ALWAYS AHEAD"

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

# MODERNIZE WITH CARBIDE



## ANY OF THESE BLADES* WILL FIT ANY LOVEJOY STANDARD 4½"-24" DIA. TYPE "A" CUTTER EVER BUILT!

*More proof of Lovejoy Milling Cutter economy.* Even if you have Type "A" mills that are 30 years old, you can utilize them to full advantage with carbide tipped blades with either positive or negative rake. The housings, whether 4½" to 24" in diameter, all take the same blade size. Their rigid construction permits the use of only ½ the regular number of blades, increasing chip load with low H.P. Thus you need no large blade inventory, but can rely on Lovejoy's large stock and prompt delivery with tips of any standard grade. You can, of course, use these same housings for standard H.S.S. or cast alloy blades —here too a single blade size will fit the complete range.

*A single size of H.S.S. and cast alloy blades will also fit every housing size.

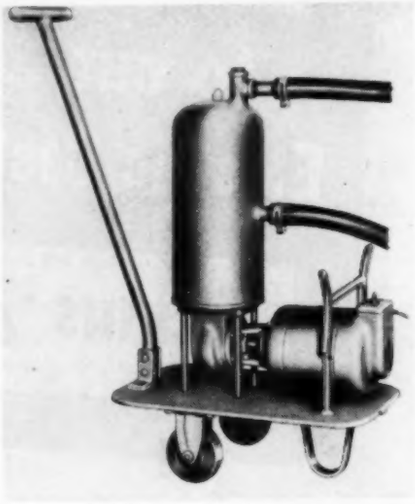
**"TOOL BITS"**

*Modern shop technique often calls for milling cutters with negative rake blades. Although certain phases of this technique are standardized, new discoveries on speeds, feeds, rake angles, etc. are being discovered regularly. Lovejoy is in constant touch with these new developments, both through their own experiments and through reports from production plants in all parts of the country. Lovejoy will be pleased to supply any information in its files and all newly acquired data. When inquiring, please give details on machine, material to be cut, etc.*

Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT


### Threaded-Head Series Cylinders Have Adjustable Cushioned Unit

Modernair Corp., 4222 Hollis St., Oakland 8, Calif., offers cushion-type cylinders for air operation. The cylinders are available with adjustable cushion units, enabling application where it is necessary to vary the speed of the cushion stroke. A variety of interchangeable mounting brackets are available. Cylinder caps are designed to take one or a combination of brackets. Due to the elimination of tie rods, the caps rotate independently of one another, 360° on the cylinder without disturbing the end seals. Full cushioned, semi-cushioned or non-cushioned models are available in 2-, 3-, 4- and 6-in. diameters.



### Portable Repriming Pump Unit Pumps Out Machine-Tool Sumps

The Rumaco Model R repriming pump unit is offered by the Ruthman Machinery Co., Cincinnati, Ohio. The pump unit is designed for pumping out dirty cutting oils or coolants from machine-tool sumps. It can also be used as a transfer pump for clean as well as dirty liquids.

The unit is equipped with a ¾-hp. motor at 3450 rpm. Capacity is 40 gpm. at 15-ft., and 15 gpm. at 3-ft. difference in level from suction nozzle to discharge level when equipped with 10 ft. of suction and 10 ft. of discharge hose.

### Black Satin Oil Offered for Machining Heat-Treated Steels

G. K. W. Oil Co., 276 Mill Hill Ave., Bridgeport 8, Conn., offers black satin oil for machining heat-treated steels of 125,000 tensile strength or better. The oil is said to allow tools to cut at reduced temperatures leaving a smooth finish. It can be used

# POTS and PANS Go HYDRAULIC!

Now, light gauge enameled ware is drawn hydraulically with fewer operations and less scrap loss. At a prominent midwestern stamping and enameling plant* an H-P-M press turned out 19,000 dish pans with only 34 rejects! Three blanks were drawn at one time!

Stock pots, 9½" deep, are drawn in a single press stroke . . . a 51% reduction in blank size. Operations were reduced from 3 to 1!

Check the above production figures! Write for details about these money saving H-P-M hydraulics.

*Name on request

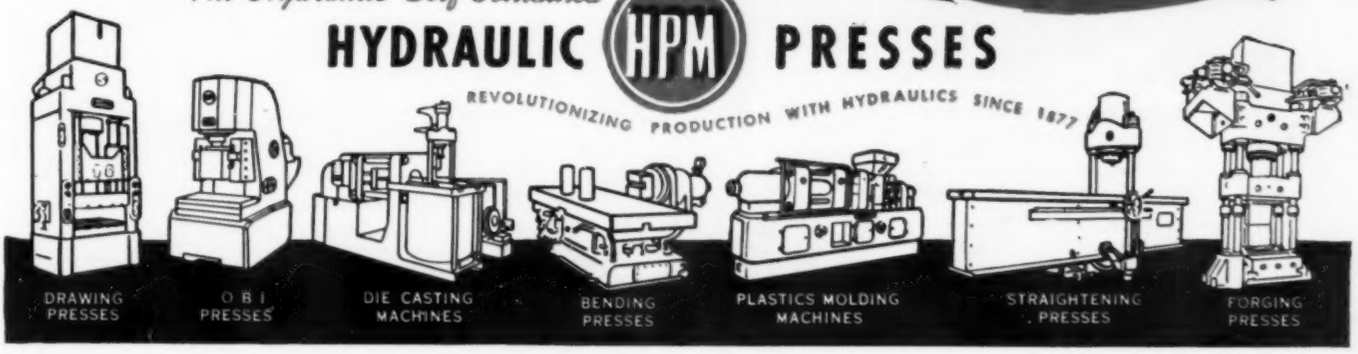
**THE HYDRAULIC PRESS MFG. COMPANY**

**1002 Marion Road • Mount Gilead, Ohio, U. S. A.**

*All-Hydraulic Self-Contained*

## HYDRAULIC HPM PRESSES

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877



# under "Arc lights" ... think of WILLSON

*Style No. 130*

**A LITTLE MONEY GOES A LONG WAY** . . . to give dependable protection to face and eyes in this ruggedly built, low cost helmet. Willson-Weld glass in non-corrosive metal holder.

*Style No. 60S*

**GIVE WELDERS' EYES A LIFT** . . . Flip-front on this one piece helmet allows quick, easy inspection and is convenient for working in close quarters. Willson-Weld Glass in hinged portion.

**WW THE MARK OF MEASURED PROTECTION** . . . The Willson-Weld* trade-mark on welding glass is your assurance of accurate grading for density of shade and thickness to meet or exceed government specifications.

*For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.*

*Reg. U. S. Pat. Off.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

READING, PA. U. S. A.

235 WASHINGTON STREET, READING, PA., U. S. A.


for tapping, milling, broaching, splining and threading, and is said to be equally as effective on boiler-plate and hardened-axle stock.

## Redesigned High-Frequency Units For Hardening, Other Operations

Redesigned high-frequency units are offered by Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York, N. Y. The models are available in 7½-, 15- and 30-kw. ratings. They can be used for high-frequency heating on ferrous or nonferrous materials. The unit without any auxiliary equipment can be used for hardening, annealing, brazing, soldering and melting.

## Boston Gear Speed Reducer Gives Increased Hp. Rating

A speed reducer is offered by Boston Gear Works, Quincy 71, Mass. to replace the Boston Gear Works Type TA Reductor. Known as Type TAN, the speed reducer features heavier gearing which allows increased hp.

# ONLY PHILLIPS

PHILLIPS HAND SCREW DRIVERS ARE MADE IN ANY TYPE YOU NEED
PHILLIPS BITS ARE AVAILABLE TO FIT EVERY TYPE OF HAND BRACE, SPIRAL, OR POWER

## Cross Recessed Head Screw Drivers and Bits are available EVERYWHERE!

One of the essentials you can't afford to overlook in choosing a cross recessed head screw is that service and repairmen everywhere be familiar with your fastenings, and have the necessary driving tools.

Phillips Hand Screw Drivers and Bits are available throughout the country, stocked by regular hardware outlets, chain stores and industrial supply houses. They are standard equipment today for maintenance workers, mechanics, small shop repairmen, and the household handyman.

Phillips Recessed Head Screws are rapidly becoming the preferred screws for all types of industrial assembly. They can help you speed work, stop spoilage, add strength and smartness. Remember, *only* Phillips Screws give you *all* the advantages of the cross recess design. Specify Phillips.

***Get this helpful new booklet***

that lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon.

**GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .**

**GET PHILLIPS *Recessed Head* SCREWS**

**Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts**

**27 SOURCES**

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Phroll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

AM-35

**Phillips Screw Mfrs.,**
**c/o Horton-Noyes Co.**
**1800 Industrial Trust Bldg.**
**Providence, R. I.**

Send me the new booklet — "How to Select Recessed Head Screws for Practical Production Driving".

Name _____

Company _____

Address _____

The finest of all hack saw blades . . .

MILFORD FLEXIBLE REZISTOR

is now made better than ever with M-2 high speed steel

This modern post-war steel means even *more* cutting . . . even *faster* cutting . . . for this outstanding blade which has been replacing all-hard blades with mechanics everywhere.

The same *safe* cutting, because it's shatter proof! The same *economical* cutting because there's no accidental breakage! Only the teeth are hardened . . . the back is tough and flexible. And the same *easy* cutting because of MILFORD'S exclusive Easy Starting Teeth.

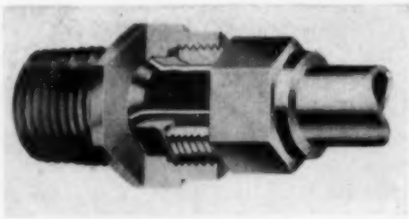
This improved performance is typical of MILFORD'S continuous research, test and experiment. As better metal-cutting saw blades are made, MILFORD is making them!

**Order from your mill supply distributor. He is always ready to serve your needs for all factory and mill supplies, as well as MILFORD hack saw and band saw blades.**

MILFORD
PROFILE AND BAND SAW BLADES
REZISTOR AND DUPLEX HACK SAW BLADES

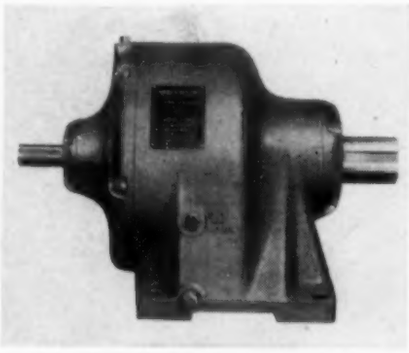
THE HENRY G. THOMPSON & SON CO.
*Saw Specialists Exclusively for Over 70 Years*
NEW HAVEN 5, CONNECTICUT U. S. A.


rating. The worm is made integral with its shaft. A vent valve incorporated in the filler plug permits the unit to breathe while keeping out foreign matter.



### Self-Flaring Tube Fitting Can Be Taken Apart, Reconnected

Scovill Mfg. Co., Waterbury 91, Conn., offers a self-flaring, leakproof tube fitting. The fitting can be taken apart and reconnected many times. Called the Uniflare, the fitting has two parts, body and nut. The thrust collar in the nut shears off under ordinary wrench force, and clamps onto the tube to form a sealed joint. Fittings are made in a complete range of sizes and shapes for use with copper, aluminum, monel and annealed steel tubing.



DIFFERENTIAL SPEED REDUCER, manufactured by Winfield H. Smith Corporation, Springville, Erie County, N. Y., features increased overhung load capacities. Called the Winsmith helical-gear differential speed reducer, it provides ratios from 5 to 1 to as high as 50,000 to 1. Horsepower ranges from 0.62 to 81.5. Six sizes are available in horizontal, vertical, and flange-mounted styles

### 3M Resin-Bond Cloth Belts Offered in Widths to 18 in.

Minnesota Mining and Mfg. Co., St. Paul, Minn., offers the "Three-M-Ite" resin-bond cloth belts, available in widths to 18 in. and lengths from 60 in. up. It consists of aluminum-oxide mineral grains in grits from 24 to 120 coated on a flexible cloth backing with a resin bond.

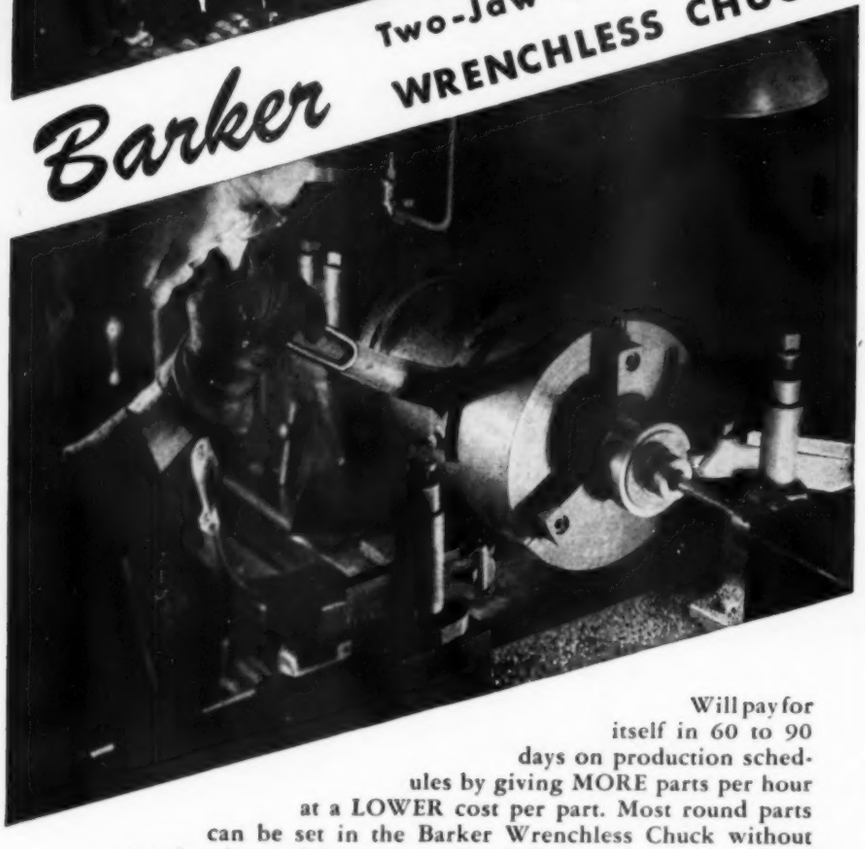
Widely known throughout the metal working industry for special tool design and "application-engineered" cutting tools, Illinois Tool Works also offers a large stock of *standard* metal cutting tools. Every stock item, from the simplest tool bit to complex combination pitch gear hobs, embodies all of the metallurgical experience, production skill and high quality standards that have earned for Illinois Tool Works the title, "Headquarters for Engineered Cutting Tools." Make Illinois Tool Works your source for standard cutting tools . . . immediate delivery from stock, overnight by air to all America.

*Headquarters for Engineered Cutting Tools*

**ILLINOIS**
**TOOL WORKS**

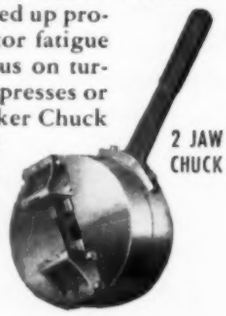
**2501 North Keeler Avenue, Chicago 39, Illinois**
**In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario**

Barker Two-Jaw or Three-Jaw WRENCHLESS CHUCK



Will pay for itself in 60 to 90 days on production schedules by giving MORE parts per hour at a LOWER cost per part. Most round parts can be set in the Barker Wrenchless Chuck without stopping the machine. It saves time, helps speed up production, is simple to operate, reduces operator fatigue and cuts spoilage where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine. The Barker Chuck shown above, replacing an ordinary 3-jaw chuck, jumped production from 18 to 24 pieces per hour. It can do it in *your* plant too. Let us show you how!

*Write for bulletin 201 today.*



Chuck Division
THOMAS HOIST CO.
22 S. HOYNE CHICAGO 12

# ROUND TABLE Discussion

## BOSS—AND BUST

Is it not a question of point of view and the make-up of a person's character? The man who hesitates to take responsibility would probably hesitate to take action in any emergency and this may be the reason for Dawson's refusal. A measure of caution is to be respected, but—carried to extremes—it can lose that quality. To the average young man however, full of life and energy, a career with a place in the sun, however dim, and the wherewithal to give his family the best life possible, are worthy aims. If he fills the position he may have obtained, worthily, not only will he be able to feel that he has taken the right line, but he will have taken that part in life his gifts have made possible. To refuse to take responsibility is to take the lower course; the negation of progress.

The Dawsons of the world are just the "also rans" of the horse race or worse. They make up the tail but while there must always be a tail, there is no virtue in being a "never-try". Supervisory duties are not lethal in character; they need a little grit.

The health of most men suffers as they grow older. Some die young, both honeybees and drones, both hunters and those who just "chew the cud". And some of both types live long, but the cud-chewer will die as he lived, an honest cud-chewer, and nothing more. Scott is credited as saying:

"One crowded hour of glorious life
Is worth an age without a name"

Dawson with his ability—and there are many Dawsons—must surely wake up.

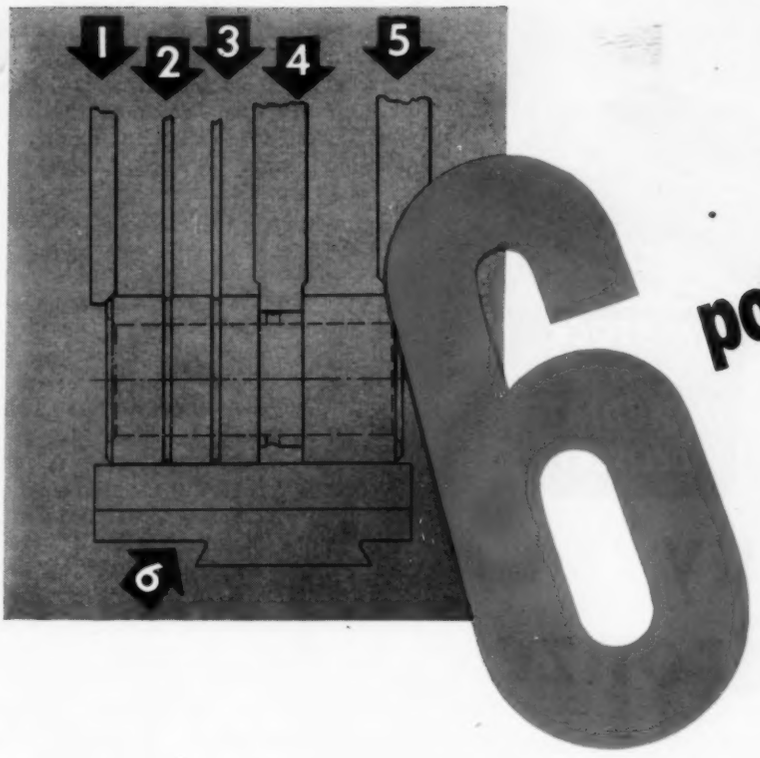
P. E. James
Lindum, England

• •

## PRESENT OR BRIBE?

In England, during the middle of the first World War, the plant where I was employed was trebled in size. With the increase in personnel there was, of course, an increase in the supervisory staff. The plant was on a 7-day a week schedule with practically all the shop workers on a piecework rate. This made their wages exceptionally high.

Although it had never been the custom before, it got to be that each bosses' cronies would take up a collection for his birthday gift. Some




# 6 point savings in tools...

## WHEN THE TOOLS ARE TANTUNG

## Tantung tools produced, in 6¾ hours, the work formerly requiring 13½ hours with high speed steel tools

Actual performance figures obtained in shops all over the country repeatedly prove Tantung superiority over high speed steel tools on jobs requiring increased production and tool life.

6 Tantung tools in a multiple tool set-up for grooving, chamfering, turning, facing and cut-off operations again pointed the way to doubled performance AT NO EXTRA COST!

For more pieces per grind at speeds and feeds above high speed steels and just below those of carbides your choice should be TANTUNG.

It's that extra speed and feed on your present equipment that means more profitable metal removing operations for you... and that extra speed and feed is obtained easily with TANTUNG.

Here's a multiple tool operation that enabled a mass production manufacturer to double his production at no extra cost.

**Performance Data**

| | |
|---|---|
| MACHINE: | Conecomatic, 8 spindle. |
| PART: | Overdrive Stationary Gear. |
| MATERIAL: | S.A.E. 4042 (cold drawn). |
| OPERATION: | Grooving, chamfering, facing, turning and cut-off operations to close tolerances and fine finish. |

**Comparative Test Data**

| | TANTUNG | H.S.S. |
|---|---|---|
| Rev. Per. Min. | 305 | 230 |
| S.F.M. | 135 | 105 |
| Cycle Time | 24.5 sec. | 57.0 sec. |
| Pieces per grind | 1000 | 425 |
| Feed: Front slide | .0014 | .0006 |
| Back slide | .003 | .0015 |

For that extra added performance that means a greater margin of profitable operation with TANTUNG call your nearest V-R branch office TODAY! If you want increased production over high speed steel tools and are unable to use carbides because of equipment limitations TANTUNG is your answer.

District Sales and Service in Principal Cities

V-R CARBIDE and TANTUNG

vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

# *Your* Best Buy *in* Bearing Bronze

When you buy Johnson UNIVERSAL Bronze you buy much more than metal. You make a wise investment in bearing performance and economical bearing life. You save considerable money too.

First, you have the widest range of sizes to choose from . . . over 350 solid and cored. Every bar is completely machined, eliminating all extra work and guaranteeing perfection all the way through. Every Johnson UNIVERSAL Bar is entirely usable from end-to-end.

When you cut the bar you are pleasantly surprised to note how easily it handles. Ordinary tools turn the metal with ease and with speed. There is no grit or sand inclusions to contend with.

When the finished bearing is installed, check up on its performance and life. Note how smooth, how quietly it operates. Note also, the exceptionally long bearing life . . . the elimination of frequent replacement.

Why not try a bar on your next job? Your local Johnson Bronze Distributor carries a complete stock for immediate delivery.

**JOHNSON BRONZE CO.**
**515 S. MILL ST. • NEW CASTLE, PA.**

*Catalogue*

*It's NEW... listing and describing the most complete bearing service in the market and it's FREE.*

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
BRANCHES IN 20 INDUSTRIAL CENTERS


of the workers would contribute as much as 10 shillings ($2)—an almost unheard of amount in normal times.

Around this time, a foreman was promoted to department manager in another part of the plant. He had been responsible, in his former job, for about 400 employees. A collection was made to give him a gift of a gold watch and chain. Many of the men gave to the collection because they felt that if they did not, they would be "victimized" sometime in the future. At the actual presentation, only 50 of the 400 workers showed up.

As in this case, most gifts to the boss are definitely bribes. A supervisor who is all-out for high efficiency and production, and who maintains an equal friendliness to all workers, does not usually get these "bribe-gifts". He has no special cronies to start the collection, and those who do not wish to contribute, or can not contribute, will not be forced to.

Arthur Sylvester
Niantic, Conn.

•

## GAMBLING ON THE LONG GREEN

The man who has the ambition and the spark of daring in him will not hesitate in chancing present earnings for possible future success in a new line of endeavor.

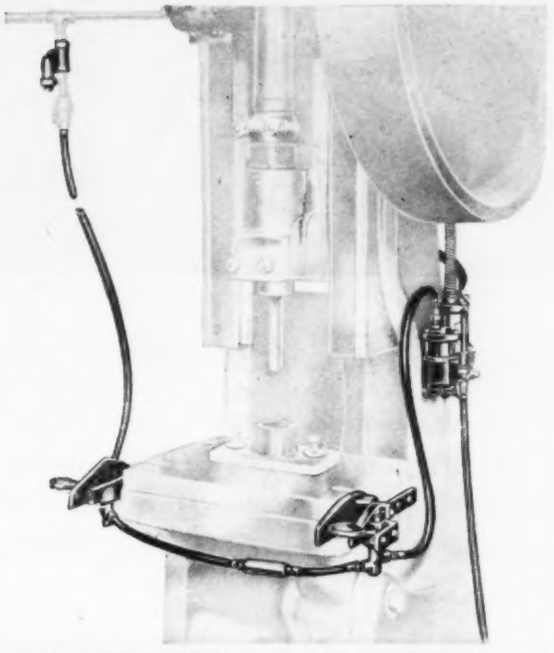
Insofar as time of life is concerned, neither youth nor age have an option on initiative and ambition, although youth is generally recognized as the best time to take chances.

We should not be too hasty in judging the man who thinks he should change his status from employee to possible future employer. The financial end of the situation may not be the important element in the picture.

As far as management is concerned, when an employee makes up his mind to leave in order to go in business for himself, it is to the best interests of both the company and the man that he should not be discouraged in his venture. Once a man of this type makes up his mind to leave, the standard of his services to his present employer may drop; his heart and mind would not be in the work.

Too many potential labor-saving devices and improvements in mechanical processes for economical improvement and better living have been lost to us and posterity because the progenitors of such devices did not have the opportunity or moral fortitude and stamina to "gamble on the long green" and take a chance with their present earnings for the unknown benefits accruing

# See this Schrader Air Control?



## IT'S THE BEST THING THAT EVER HAPPENED TO THIS PRESS . . . *and me!*

These highly competitive days demand efficient manpower. You can't afford lost man hours through accidents.

Schrader Air Controls give you greater safety plus ease of operation plus elimination of fatigue. Production flows smoothly and steadily. Hands are kept out of danger while the press is in motion.

Schrader Controls are true two-hand devices . . . foolproof . . . can't be disregarded by the operator. And so versatile they can be changed over to any type of press room operation: two-hand, one-hand and one foot, foot, etc.

Schrader Controls come in packaged units to fit all requirements. They are easily installed and require a minimum of maintenance and attention. Thousands are in use and accepted by some of the biggest companies in industry.

Check your power presses now and order Schrader Pneumatic Press Controls for more production and more efficiency . . . with safety . . . in your shop.

**A. SCHRADER'S SON, 490 Vanderbilt Avenue**
**Brooklyn 17, N. Y., Dept. AM015**
**Division of Scovill Manufacturing Company, Incorporated**

Please send your FREE BULLETIN and more information about the products I have checked in circles below.

NAME_____

ADDRESS_____

COMPANY_____

CITY_____ STATE_____

- ○ *Air Cylinders*
- ○ *Air Valves*
- ○ *Press Controls*
- ○ *Air Ejection Sets*
- ○ *Blow Guns*
- ○ *Air Line Couplers*
- ○ *Air Hose & Fittings*
- ○ *Hose Reels*
- ○ *Hydraulic Gauges*
- ○ *Air Pressure Regulators*

# *Use AMES Horizontal Indicators*

The highly accurate, highly sensitive Ames Horizontal is the right indicator for right-angle readings. It is invaluable for tool room and production jobs where it is advantageous to have the dial in a horizontal plane, and on work surfaces where the use of regular indicators is impractical.

The Ames Horizontal is designed with the usual Ames approach of *sustained accuracy through simplicity.* Action is obtained through a rack and pinion—there are no spirals, cams or levers which might introduce wear and incorrect dial readings. Because of its sturdy, forged brass construction, any surface of the case may be used for mounting—or the regularly supplied holding rod may be used.

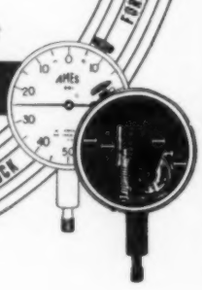
*Be sure you're right at right angles,* specify Ames Horizontals. Write for new bulletins describing all sizes and models of this modern gauge.

A Universal or Hole Attachment may be clamped to the stem of the Ames Horizontal. It will check holes, stationary or revolving, up to 1¾" deep. This Ames attachment is a favorite for speeding up the performance and accuracy of service and maintenance work.

*Address inquiries to Home Office, 26 Ames Street*

B. C. AMES CO. *Waltham 54, Mass.*

MANUFACTURER OF MICROMETER DIAL GAUGES
AND MICROMETER DIAL INDICATORS
*Representatives in principal cities*



HARDENED STEEL GUIDEPIN AND BLOCK • FORGED BRASS CASE AND STEM • FORGED WHEEL SUPPORTS • ORNAMENTED HARDENED BEARINGS


from future developments in an alien field.

Time and tide wait for no man, and only the postman knocks twice. The worker who takes the chance now to enter a new and unproved enterprise in which he deeply believes he will find success merits the best advice from his present employer.

Harry Kaufman
Philadelphia, Pa.

•

PROSPECTING

As Al says, if "Free Enterprise" is a present fact, not just a dream of the future, it belongs to the worker as well as to management. Management must take the initiative to make free enterprise more than a political slogan, or the worker will turn to radical leadership with more promising slogans.

If management wants an open shop with freedom to hire whom it pleases, it must also grant the worker freedom to choose his employer without jeopardizing his livelihood. Any worker fair and honest enough to advise his employer of his intention to leave when a better job is available will not lay down on the job or work against his employer as long as he remains. No man who had intentions of laying down on his job would give his boss a warning, and this fact should be appreciated.

Management in general shoud be encouraged to be fair with its workers, especially so to those who deserve special consideration. Management can be accurately judged by its attitude toward its workers, because a boss who is fair to his workers will be equally fair to his customers, suppliers, competitors and tax collectors.

Management should learn that a boss who boasts of his tricky procedures with his employees must be watched carefully in his other business dealings. Workers usually know from observation the safe procedure to use in obtaining a new job, and the employer will receive the same consideration that he grants to his employees. My personal experience has proved this to be true, although I must admit that the one employer who encouraged my search for another job was glad to be rid of me. Strange as it may seem, the one who made it necessary to negotiate secretly told me that the door would always be open to return. Obviously then, the answer to the question depends on the company, because the worker has to base his method on the existing conditions.

C. A. Johnson
Springfield, Mass.

"THE RIGHT FILE FOR THE JOB"

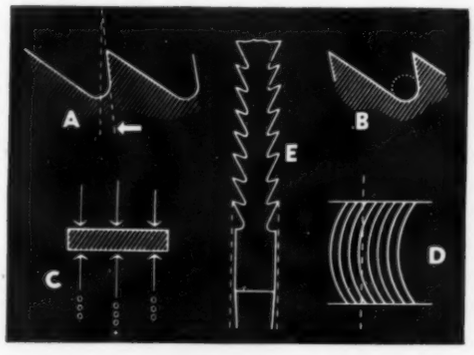
conserves materials, saves workmen's time, improves results—cuts production costs. This is one of a series of advertisements on kinds and uses of files. Save it, with the others, for shop and purchasing references.

**Subject: CURVED TOOTH FILES** — **Prepared by Nicholson File Co.**

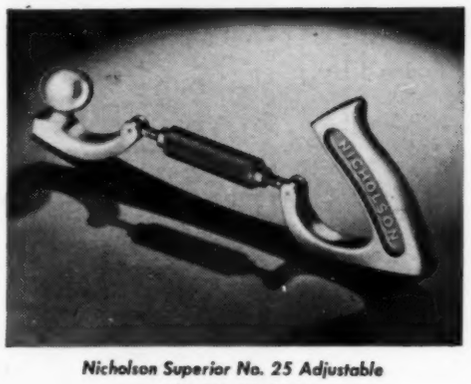
*Nicholson Superior Milled Curved Tooth File (Flat Rigid Tanged Type)*

**NICHOLSON SUPERIOR MILLED CURVED TOOTH FILES** are made on newly designed Nicholson machinery and embody important improvements that fully justify the "superior" part of their name. Widely used by the automobile manufacturing and repairing industry on body work, they are nevertheless of great practical value in many other types of shop work. They are ideally fitted for smooth work on sheet and other steels up to the hardness of commercial annealed tool steel; and on cast iron, bronze, aluminum, zinc, babbitt, lead and plastics.

**CONSTRUCTION.** In the aggregate, little things make big differences in curved tooth files. Note the technical distinctions described and illustrated here. (A) Teeth have the proper face angle (positive) for good bite without pinning up. (B) Gullets are carefully designed and smoothly rounded for minimum clogging. (C) Cross-section has very slight fullness for even tooth wear and level cutting under normal filing pressures. (D) Tooth radius is designed to keep at least two teeth in contact with the work along any one line, to eliminate chatter. Greater shear angle at edges results in smooth cutting with less pressure, less clogging. (E) Preforged tang (in Rigid tanged type) has teeth stopped off to leave a clean shoulder *below level of teeth-tops* — insuring strength and allowing file to be used as a surfacing tool.




**RIGID AND FLEXIBLE TYPES.** Besides the Flat tanged shape, RIGID Nicholson Superior Curved Tooth Files come in Half Round, Half Oval, Pillar and Square tanged shapes; Half Round Shell (teeth on convex side only) and Half Round Moulding (teeth on concave side only) — both with holes, instead of tang, for use in rigid-file holder. FLEXIBLE type comes in the Flat shape only — with holes for use in flexible-file holders. At left is shown the newest Nicholson holder design — made of lightweight aluminum with improved turnbuckle adjustment for using file on either concave or convex surfaces of varying degrees. Obtainable through industrial distributors.



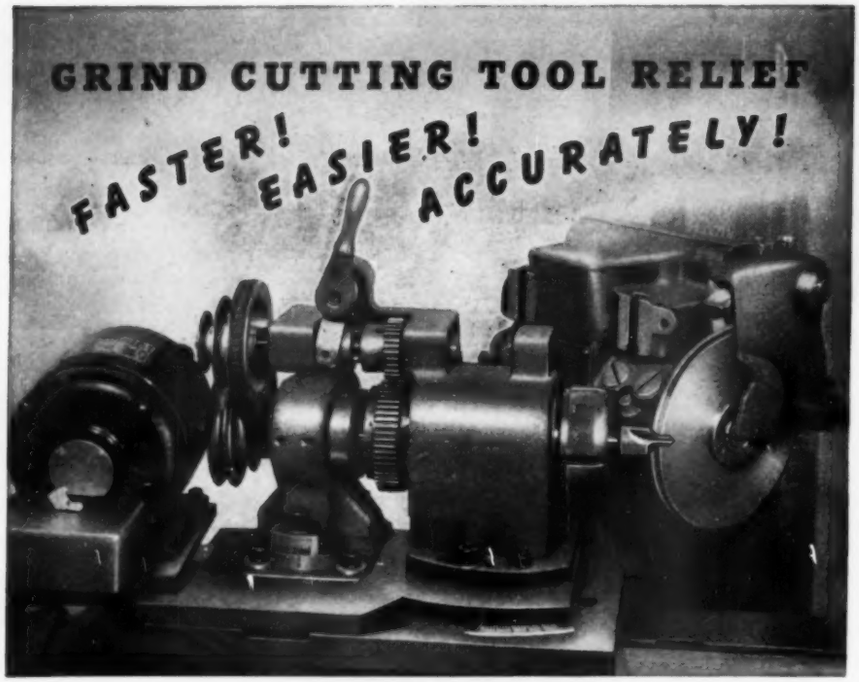

*Nicholson Superior No. 25 Adjustable Flexible File Holder*

*Nicholson makes special-purpose files for Brass, Lead, Aluminum, Stainless Steel, Foundry Castings, Die Castings, Die Making, Lathe Filing, Curved and Shear Tooth Filing—and Swiss Pattern files of all shapes and sizes.*

**FREE BOOK, "FILE FILOSOPHY"** — 48 instructive pages on kinds, use and care of files. Your foremen need it.

**NICHOLSON FILE CO., 29 Acorn Street, Providence 1, Rhode Island**
*(In Canada, Port Hope, Ont.)*

**NICHOLSON FILES FOR EVERY PURPOSE**




WITH THE

# CIRCULARITY-GRINDING ATTACHMENT

DEVELOPED by the Detroit Reamer & Tool Company, the Circularity-Grinding Attachment has been used successfully for several years in the manufacture and reworking of cutting tools. Form relief, radial relief, form and radial relief together, straight and tapered cylindrical work all may be accurately ground with this attachment . . . thus in many cases it replaces a motor-driven headstock.

*for*

- ★ Form Relief — Radial Relief — Form and Radial together — Straight and Tapered Cylindrical Grinding
- ★ Easily mounted on all Universal and Cutter Grinders
- ★ Work held between dead centers or in collet
- ★ No special cams or fixtures needed for any set-up

axial center. Set-ups are simple and the Circularity-Grinding Attachment provides identical relief on every tool ground from the same set-up.

The work may be held in a collet (0" to 1¼") or between dead centers. In either case the work always revolves on its own

Send for our new illustrated bulletin which gives complete explanation of set-up and operation of the Attachment. Write today.

D R & T COMPANY

**DETROIT REAMER & TOOL CO.**

*Mfrs. of Special High Speed Cutting Tools*

**2830 East 7 Mile Rd. Detroit 12, Michigan**


## Names in The News

A. F. Vinson

**A. F. Vinson,** formerly assistant production manager, G-E Apparatus Department and chairman of the Welding Committee, has been appointed manager of G-E's Welding Division, which includes plants at Holyoke, and Fitchburgh, Mass.

**Art Pace** has been named product engineer in charge of radiography and fluoroscopy at General Electric Company; **Joseph W. Ranftl,** merchandising assistant, x-ray diffraction; **Dennis Vath,** laboratory assistant, x-ray diffraction; and **Ruehen Hackbart,** laboratory assistant, radiography and fluoroscopy.

Frank B. Powers

**Frank B. Powers** has been appointed as assistant vice president of the Production Department of the American Car and Foundry Company.

**L. D. Yager** has been appointed Division Manager of the Detroit Sales Office, Aluminum Division and Industry Manager, Automotive Division, Reynolds Metals Company.

# HALF

p·H control

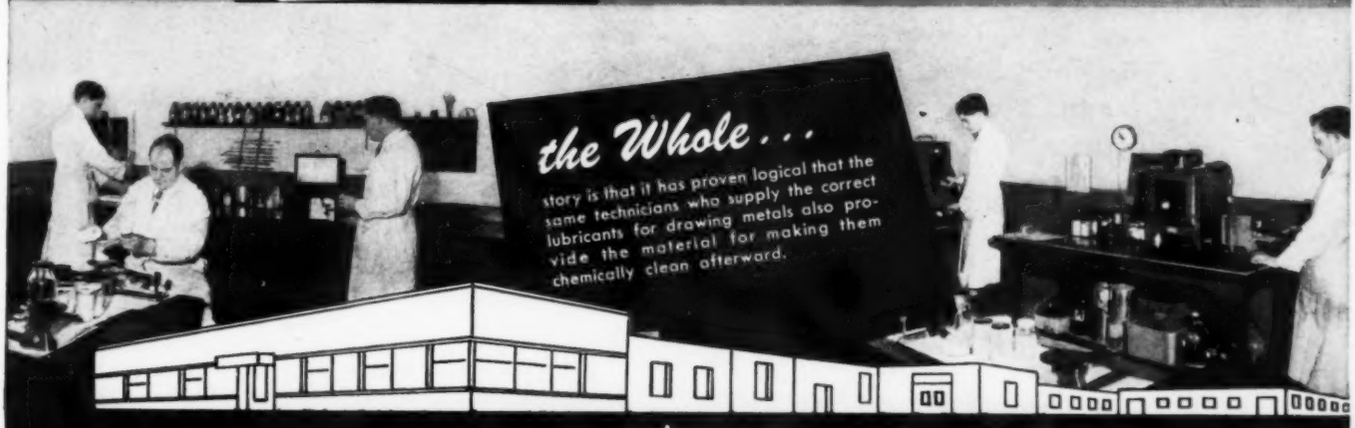
Half of this message has to do with NORTHWEST products and processes for chemically cleaning ferrous and non-ferrous metals preparatory to plating, vitreous enameling, painting, etc., each problem involving a specific programing of one or more of the thirty-five standard NORTHWEST Cleaning Compounds including Electrolytic, Immersion, Solvent, Spray, and Water Wash types . . . the "Lo-Hi" pH process of chemically cleaning metals, preparatory to plating, porcelain enameling, etc., makes practical a control that management can plan on in these departments regardless of the type of metal or soil . . .

*the other*

# HALF

SUPER-DRAW

is concerned with metal forming lubricants developed for ferrous and non-ferrous metals in both pigmented and non-pigmented form . . . SUPERDRAW products are specifically compounded for: 1. Brass and Brass Alloys, 2. Cold Rolled Steel, Enameling Iron, Stainless Steel and Aluminum, 3. Alloys of Steel, Aluminum and Copper . . . SUPERDRAW compounds will handle light, medium, and heavy operations . . . may be applied by brush, roller, spray, or dipping . . . A request on your letterhead will bring a technician to consult you on your drawing and cleaning problems . . .


*the Whole . . .*
story is that it has proven logical that the same technicians who supply the correct lubricants for drawing metals also provide the material for making them chemically clean afterward.

LO° HI pH

**NORTHWEST CHEMICAL CO.**

9310 ROSELAWN DETROIT 4, MICH.

Note your specific interest on the coupon below and attach to your letterhead. It will bring complete information.

p·H *Cleaning control*

- Electrolytic ☐
- Immersion ☐
- Solvent ☐
- Spray ☐
- Water Wash (Paint Booth) ☐

Ferrous ☐ Non-Ferrous ☐

SUPER-DRAW *Metal Forming Lubes for*

- Cold Rolled ☐
- Enameling Iron ☐
- Stainless Steel ☐
- *Special Alloys of:*
- Steel ☐ Brass ☐
- Aluminum ☐

Ftd ☐ Non-Ftd ☐

*pioneers in pH cleaning control — serving you since* '32

HAVE YOU A

*Finishing Filing Job?*

USE

"AMERICAN SWISS"

SWISS-PATTERN FILES

Those final finishing touches can make or break a job—they need the finest of files as well as a skilled craftsman. With "American Swiss" Swiss-Pattern Files, you can always be sure of clean sharp teeth that remove just the right amount of metal from just the right places . . . you can be sure, too, of the uniformity of hardness throughout the length of every file that helps you judge the filing pressure to be used. You're always safe with "American Swiss".

*Buy from Our Authorized Distributor*

**AMERICAN SWISS FILE & TOOL CO.**

410 Trumbull Street ELIZABETH 1, N. J.

ASK FOR THEM BY THIS NAME

*American Swiss* ★★★

SWISS PATTERN FILES

D. A. Hutchinson

**D. A. Hutchison** has been named general sales manager of Sterling Tool Products Company.

**Alden G. Roach,** now president of Consolidated Western Steel Corporation, will succeed **J. Lester Perry** as president of Columbia Steel Company.

Daniel H. Haynes

**Daniel H. Haynes,** vice president and director of American Machine and Foundry Company, has been named to succeed **John W. Hooper** as treasurer of the company on January 1, 1949.

**Al Bailey** has been appointed general manager of Kieley & Mueller, manufacturer of automatic control valves. Mr. Bailey will make his headquarters at the company's plant in North Bergen, N. J., but will also travel throughout the United States.

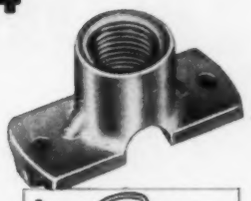
**A. H. Behnke** has been elected vice president in charge of materials, of Hotpoint, Inc.

**N. J. Kenny,** president of Ohmer Corporation, has resigned that position and will return to the Rockwell Manufacturing Co., Pittsburgh, in an executive capacity.

# Bodine

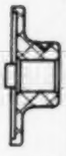
## CASE HISTORY No. 24

**VERSATILITY:** A No. 42-30 Dial Type Automatic Drilling, Tapping, Screw Inserting machine tooled to produce two different die cast electrical components.

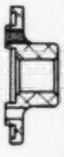


1 HAND LOAD CASTING TO DIAL (1 PER STROKE)

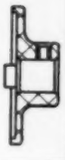
2 SPOT DRILL, C'SINK SET SCREW HOLE



3 TAP ONE 6-32 CORED HOLE (HORIZONTAL SPINDLE)



4 DRILL No 29 HOLE FOR SET SCREW

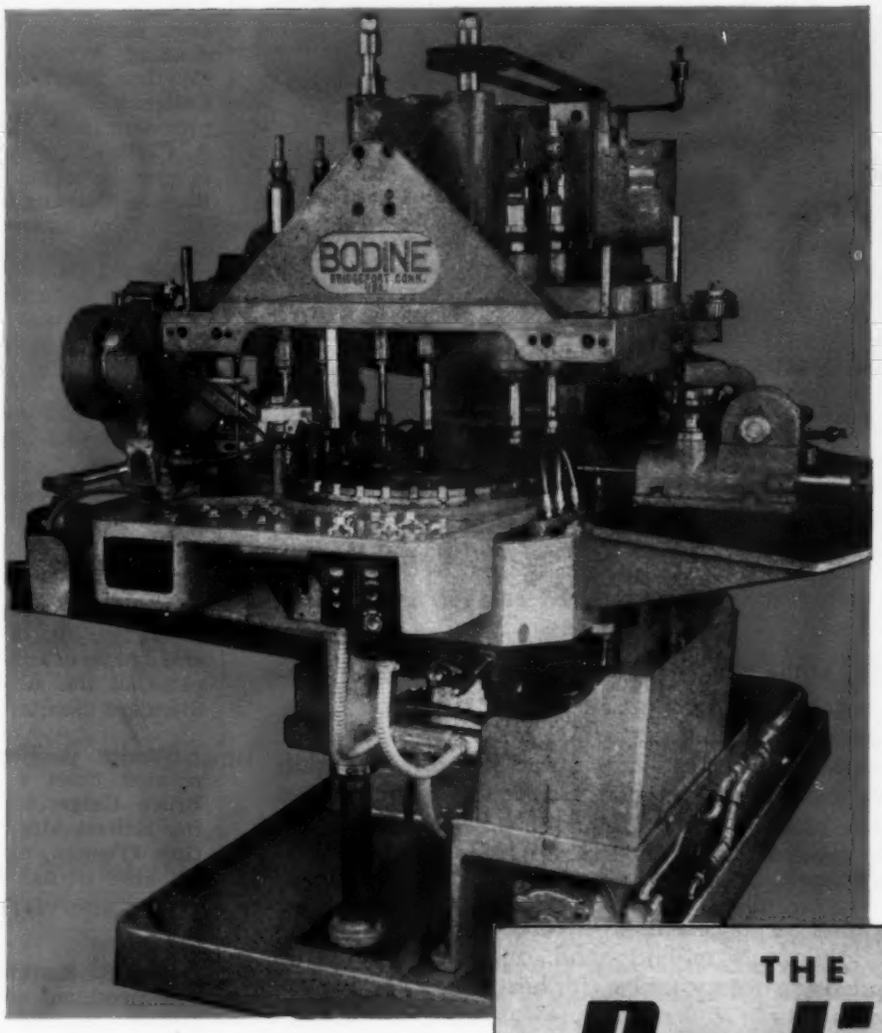


5 TAP SET SCREW HOLE 8-40

6 TAP ONE 6-32 CORED HOLE (HORIZONTAL SPINDLE)

7 TAP CORED CENTER HOLE ⅛" STRAIGHT PIPE THREAD (Remove burr from set screw hole.)

8 INSERT ONE 8-40 x ¼" SET SCREW AUTOMATIC EJECT




1 HAND LOAD CASTING TO DIAL (2 PER STROKE)

2 REAM CORED HOLE 29/64" DIA

3 TAP CENTER HOLE ¼" STRAIGHT PIPE THREAD

4 TAP ONE 8-32 HOLE

5 TAP ONE 8-32 HOLE

6 AUTOMATIC EJECT

**PRODUCTION:** Each job requires its own dial and easy relocation of some spindles (all adjustable). Cap X-2740 (left above) is produced at rate of 22 pieces (154 operations) per minute. Hickey X-2666 (right above) produced 34 pieces (136 operations) per minute (2 pieces per stroke). Unless stated all spindles are vertical.

**VERSATILITY** of this machine can be of tremendous advantage for low cost production of a wide range of small parts. Write for recommendations. Send for Catalog.

THE **Bodine** CORPORATION

BRIDGEPORT 5 CONNECTICUT

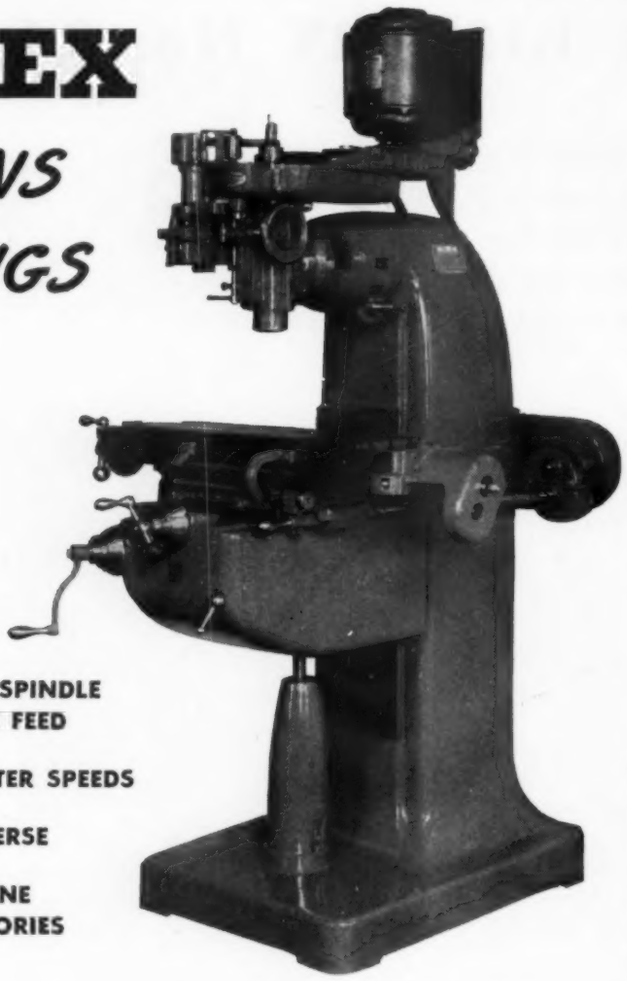
AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

9DD49

*For Tool Room and Production Line*

# INDEX

## *MEANS SAVINGS*



- **AUTOMATIC SPINDLE AND TABLE FEED**
- **TWELVE CUTTER SPEEDS**
- **RAPID TRAVERSE**
- **COMPLETE LINE OF ACCESSORIES**

*Write for Literature or See Your Local Dealer*

*The Model 50 Index Milling Machine* has a greater scope of usefulness than any machine of comparable size or cost, and offers substantial savings in production time and labor. It is tops for general tool room work, including locating and jig work. In addition, the machine's rigidity and freedom from chatter even under severe hogging cuts, plus the ease with which any necessary rate of feed can be obtained, and the rapid traverse for re-positioning, puts this machine definitely on the production line.

The complete line of accessories available, including end measuring rods, right angle milling head, and both hand and power operated precision rotary tables, further increases the usefulness of this machine.

NOTE: The reliable and time proven Model 40-H Index Mill still is and will continue to be available.

**INDEX MACHINE CO.**

540 N. MECHANIC STREET JACKSON, MICHIGAN

Nelson M. Hopkins

**Nelson M. Hopkins,** formerly sales manager of Kans & Roach, Inc., has been named assistant to the president of Acme Pattern & Machine Co., Inc., Buffalo, N. Y. **Robert E. Coleman** has been appointed vice president in charge of sales; **William A. Carlson,** vice president in charge of manufacturing, and **Henry M. Williams,** chief engineer of the Fabricating Equipment division.

**Richard M. Galbreath,** formerly with the American Smelting & Refining Co., is now associated with his father of the Galbreath Machinery Co., Pittsburgh.

**Arthur A. Berard,** executive vice president and general manager of the Ward Leonard Electric Co., Mount Vernon, N. Y., has been elected President, succeeding **Dawson J. Burns,** who was named chairman of the executive committee.

**William H. Oliver** has been appointed to the new position of general superintendent of the Bond plant of the American Radiator & Standard Sanitary Corp., Buffalo.

**Stanley O. Thomas** has been appointed chief motor engineer and **Bruce Geiger,** service engineer, of the Hobart Mfg. Co., Dayton, Ohio. **Guy Elleman,** managing director of Hobart's British operations, has retired. He is succeeded by N. J. Glanfield.

**Roy S. Rankin** has resigned as vice president and director of sales, Harris Calorific Sales, Inc., Detroit, to become manager of the Progressive Welder Sales Co. of Michigan, Maccabees Building, Detroit.

**William J. Swallow** has been appointed manager of the Buffalo assembly plant of the Ford Motor Co., succeeding **Edward C. Miller,** who has been promoted to manager of the Dearborn, Mich., assembly plant.

**Theodore H. Gray,** formerly with the Westinghouse research laboratories at East Pittsburgh, has joined

# The MAGNA-SINE cuts tool room costs HERE

- *For single and compound angle set-ups.*
- *For grinding, boring, inspection and other operations.*
- *Set up with standard gauge blocks . . . positive accuracy.*
- *Permanent-magnet chuck holds work securely without distortion.*

For grinding and other operations where the work must be held at a compound angle, the Magna-Sine saves money and increases accuracy. Jobs that take an hour or more to set up by other methods can be set up securely in a few minutes with a Magna-Sine.

The Magna-Sine is set up by the sine bar method using standard gauge blocks. Work is clamped or released from the permanent magnet chuck instantly by turning the handle. The amount of magnet holding power is determined by the amount that the handle is turned—thus making it possible to hold extremely thin pieces without warpage.

Thousands of these versatile time-savers are in use daily. Many users have standardized on Magna-Sines for all angular work after seeing how the Magna-Sine pays for itself in just a few set-ups.

Write today for catalog which gives complete story on operation and models available. *Robbins Engineering Company, 318 Midland Avenue, Detroit 3, Michigan.*

Robbins
ENGINEERING COMPANY

*Producers of* ROBBINS MAGNA-SINE • ROBBINS UNIV-ANGLE ROBBINS SINE PLATE • ROBBINS INDEX TABLES ROBBINS No. 3 DRILLMATIC • SPECIAL MACHINERY.

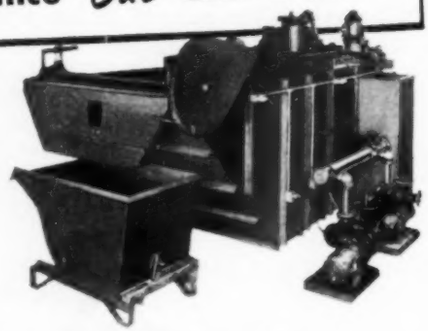
# Which GRINDER has HOFFMAN Filtration?

2 hrs. for cleaning
5 to 10 wheel dressings
14 adjustments for size
8 hrs. without stop
1 wheel dressing
1 adjustment for size

Using two identical grinders, a prominent automobile manufacturer never made scheduled production on cast iron valve guides. Then a Hoffman Model 18 Flotation Unit was installed on one of the grinders. It ran without pause through a full eight-hour period. The other grinder required from 20 minutes to an hour to get it to run properly (see panel above.) Now Hoffman flotation equipment enables the car maker to meet higher production schedules easily.

**In your case, too, HOFFMAN AUTOMATIC COOLANT CLARIFICATION will *Increase* Productivity *Save* Maintenance *Cut* Unit Cost!**

Entirely automatic—no filters to change, no strainers or sumps to clean. Former "down" time becomes new productive time while you save wheels, diamonds and soluble oil replacement costs in the bargain. Total savings more than pay back your investment. For increased, low-cost machining, get the facts in Bulletin A-690 *now*.



Models from 20 to 1,000 g. p. m.
Larger sizes to your specifications

**U. S. HOFFMAN** MACHINERY CORPORATION 211 Lamson St., Syracuse, N. Y.
COOLANT FILTERS • FILTRATION ENGINEERING SERVICE


the staff of Metallurgical Engineers, Inc., Portland, Oregon.

**A. R. Senter** has been named manager of the Ashland Fabricating Division, Ashland, Ky., of Armco Drainage & Metal Products, Inc., succeeding the late Willard See.

**Ralph W. Morrison** has been appointed General Sales Manager of The Aro Equipment Corporation, Bryan, Ohio.

**C. I. MacGuffie** and **R. C. Freeman** have been appointed manager of sales and manager of engineering, respectively, of General Electric Welding Division.

**Herman C. Phelps** has been named sales manager for the All-State Welding Alloys Co., Inc., White Plains, N. Y.

**Al Bailey** has been appointed general manager of Kieley & Mueller, manufacturer of automatic control valves.

**Stanley Ostrander** has been appointed manager of operations of Lincoln-Mercury Division of Ford Motor Company. He was formerly manager of Highland Park operations.

## Business Items

**Greer Hydraulics, Inc.,** has opened a new branch office at the Keith Building, Dayton, Ohio. The new office is under the direction of Sumner L. Barton.

**The Progressive Welder Sales Company** of Ohio has been organized to handle sales of resistance welding equipment in Eastern Ohio, Western Maryland, Western Pennsylvania and the northern section of West Virginia.

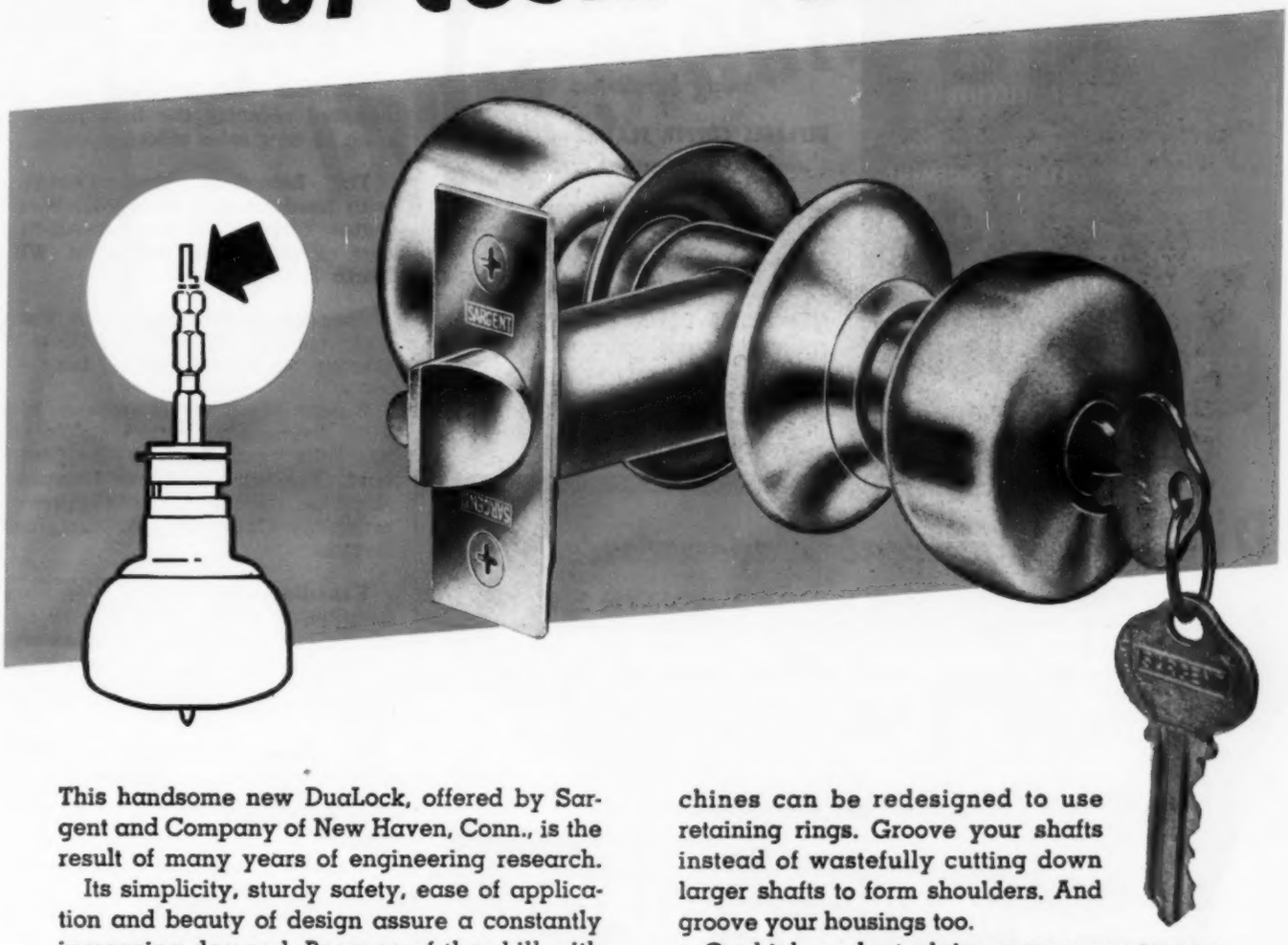
**East Dayton Tool and Die Co.,** Dayton, Ohio, has purchased the **W. S. Hawker Sons Mfg. Co.,** manufacturers of machinery for turning out wood doweling. R. C. Renner, president of the purchasing company said the firm would be operated as a subsidiary and for the time being would turn out the same products.

**The Boye and Emmes Machine Tool Company,** Cincinnati, Ohio, manufacturers of engine lathes, has appointed the Frank A. Meyer Company, 401 N. Broad Street, Philadelphia, as their exclusive sales representative in eastern Pennsylvania, southern New Jersey, and Delaware, and Barry & Son Company, 406 West Franklin Street, Baltimore, for the state of Maryland.

**McBeth Machinery Company,** Pittsburgh, Pa., has been appointed exclusive representative of the **Hauser Machine Tool Corporation,**

# National Retaining Rings

## cut costs again!




This handsome new DuaLock, offered by Sargent and Company of New Haven, Conn., is the result of many years of engineering research.

Its simplicity, sturdy safety, ease of application and beauty of design assure a constantly increasing demand. Because of the skill with which fine precision parts are built into this greatly simplified lock it requires only an exceptionally small cross bore.

By using National retaining rings Sargent saves material, weight, space and assembly time—without sacrificing efficiency or strength.

Examine your products—metal, wooden or plastic. Many products as well as many machines can be redesigned to use retaining rings. Groove your shafts instead of wastefully cutting down larger shafts to form shoulders. And groove your housings too.

Our high grade steel rings assure greater savings and greater margin of profit.

Let us show you how retaining rings can do an efficient job for you. These inexpensive, efficient artificial shoulders save time, save weight, save space, save materials, save money.

Write today for descriptive folder of many types of National retaining rings.

## THE NATIONAL LOCK WASHER CO.

NEWARK 5, N. J. MILWAUKEE 2, WISCONSIN

COMPLETELY **NEW**
CASE HARDENING PROCESS

*Carburit*

ULTRA RAPID PACK HARDENING PASTE

HIGH RAPIDITY OF PENETRATION
*.040" in 25 to 30 Minutes*

SOLVES PROBLEM OF SELECTIVE HARDENING
*by applying only to desired sections*

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
*—even an open fire will suffice*

ENORMOUS TIME SAVING
*—repair units can be hardened right in maintenance shop. No special training required*

CARBURIT IS NON-TOXIC

*Isopac*

ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

*While rest of workpiece is being hardened*

REPLACES COPPER PLATING—
*and other expensive methods.*

JUST PUT ON AND KNOCK OFF
*Saves time, money.*

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

NO SHRINKING OR CRACKING

*Guaranteed Results*

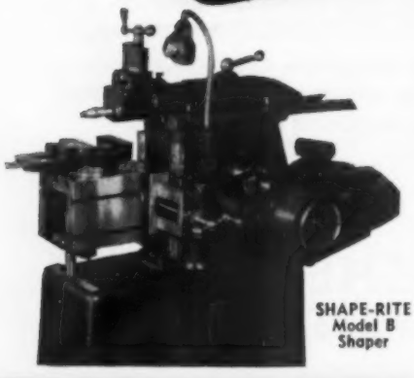
*Send for completely descriptive circular*

**DENFIS** *Chemical Laboratories Inc.*

172 PACIFIC ST. (Phone UL 5-5295) BROOKLYN 2, N. Y.

*Increase Your Output with Faster Setups—*

use the efficient SHAPE-RITE SHAPER



SHAPE-RITE Model B Shaper

The 8" Hy-Duty Model Shaper, taking a full 8" cut, is unexcelled for tool and die makers and small instrument manufacturers.

SHAPE-RITE SHAPERS are engineered to provide faster set-ups . . . one of the most important elements for greater production.

Maximum versatility . . . controls within easy reach . . . and many other built-in features cut set-up time to a minimum and eliminate many costly jobs.

Furnished with plain or swiveled table, the SHAPE-RITE SHAPER provides fast, economical operation. Investigate it now!

*See your dealer or write Dept. 248*

*Sales Service Machine Tool Co.*

PRESS RITE PRESSES · SHAPE RITE SHAPERS · KELLER POWER HACK SAWS

2363 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

manufacturers of jig borers and other precision machinery in Pennsylvania, West Virginia, and Ohio territory.

**Western Electric Company** has completed its new electronics plant at Allentown, Pa. The completion of this plant marks a climax in an architectural trend started 18 years ago, when the Austin Company laid out basic plans for the world's first controlled-conditions factory.

**Reynolds and Reynolds Co.** announced recently the firm plans to open 10 new sales offices soon.

**The Interstate Steel Company** with headquarters at 308 W. Washington Street, Chicago, announce a new Philadelphia office at 6701 North Broad Street.

**Borg-Warner International Corp.** will handle export activities of **Warner Machine Products, Inc.**

**Burgan Machinery Company,** 9527 Fifth Avenue, Inglewood, California, has been reaffirmed by the **Cleveland Tapping Machine Company,** Hartville, Ohio, as its sales representative in California, Arizona, and Nevada.

**Vanadium-Alloys Steel Company,** Latrobe, Pa., has announced the formation of a subsidiary, **Vanadium Alloys Steel Societa Italiana,** in cooperation with Elli, Zerboni & Company, of Turin, Italy.

**The Lennox Furnace Co.,** Marshalltown, Iowa, has opened a fabrication plant for furnace fittings in Salt Lake City.

**Wheel Trueing Tool Company,** Detroit, has appointed Arthur J. Baehr representative in the Pittsburgh area. He has represented the company in the Cleveland area for some time and will continue to make his business heaquarters at Chagrin Falls, Ohio.

## Obituary

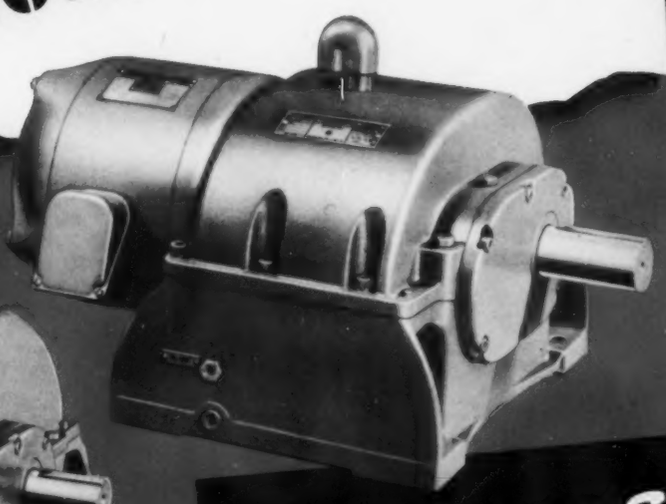
**Charles R. Bennett,** 59, for 27 years a research engineer for the Buckeye Tools Corporation, died October 23.

**George J. Chapman,** assistant manager of General Electric's Appliance & Merchandise Department, died of a heart attack at the age of 57 at his home in Greenwich on October 19.

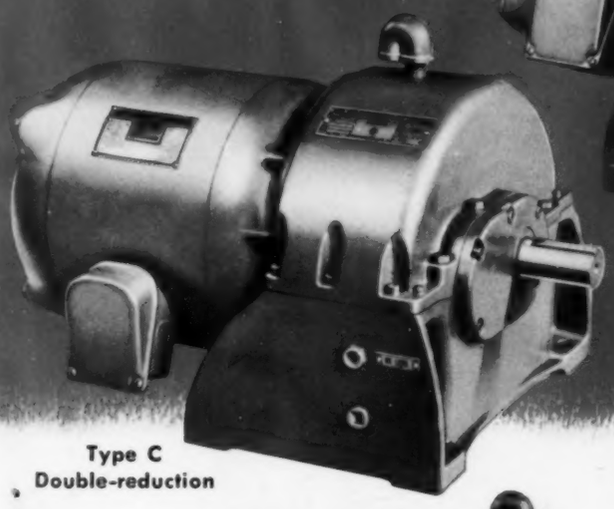
**Eugene M. Marchand,** 47, Plant Engineer of the Sandusky Plant of New Departure Division of General Motors, died October 20th after being stricken while working at his desk.

WESTINGHOUSE GEARMOTORS

# NOW AVAILABLE FROM STOCK



Type E
Double-reduction



Type C
Double-reduction

YOU CAN BE SURE
IF IT'S Westinghouse

Type A
Single-reduction

## WESTINGHOUSE NOW OFFERS IMMEDIATE DELIVERY ON POPULAR SIZES AND TYPES

Westinghouse Gearmotors are today's best answer for obtaining speed reduction on drive applications from 1 to 75 hp. And now, Westinghouse offers immediate delivery from stock. More than 50 sizes and types are available, comprising commonly used designs, and a few units with special auxiliary features. Many are powered by the revolutionary new Life-Line motor . . . the greatest advance in motor design in 58 years. Call your nearby Westinghouse representative for details on gearmotors available to fit your needs. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-07272

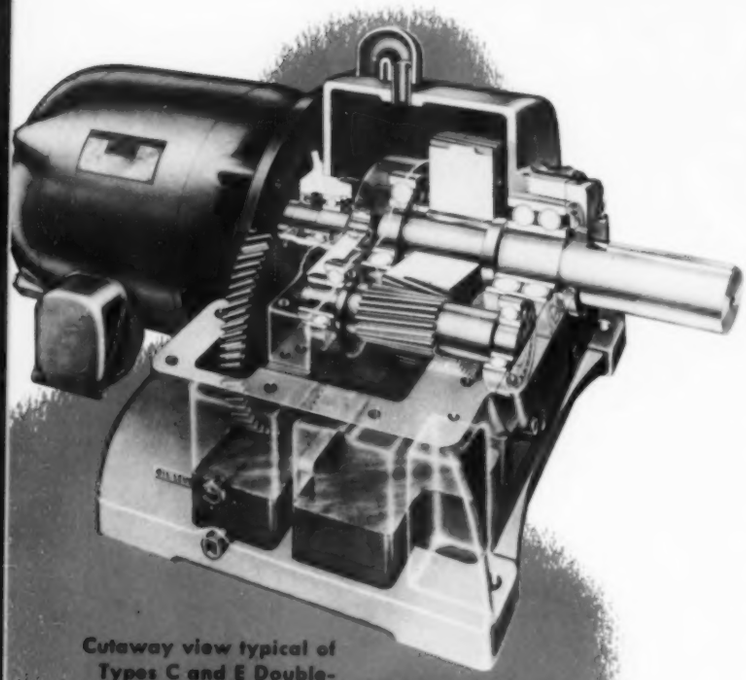
MEMBER OF AGMA WESTINGHOUSE

Westinghouse

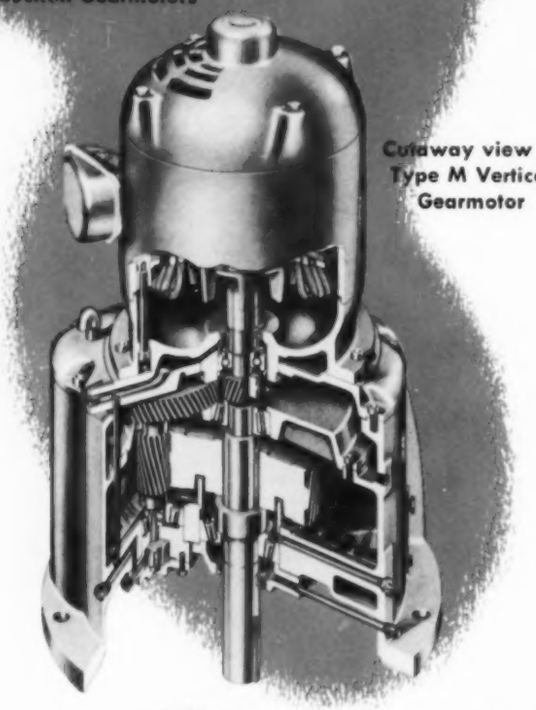
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

GEARMOTORS

# HERE ARE REASONS WHY YOU SHOULD USE WESTINGHOUSE GEARMOTORS



Cutaway view typical of Types C and E Double-reduction Gearmotors



Cutaway view of Type M Vertical Gearmotor

For the four out of five drives that require speed reduction, Westinghouse Gearmotors are the best means of increasing efficiency and safety in widely varying applications. They provide the ideal drive because motor and gear-reduction mechanism are combined in one compact unit. Three standard AGMA classes give a wide variety of service and, in addition, special types are built to meet unusual requirements.

## HERE ARE SOME OF THE WAYS WESTINGHOUSE GEARMOTORS AID PRODUCTION

- **MORE COMPACTNESS**—less floor space.
- **MORE FLEXIBILITY** in arrangement or rearrangement of equipment.
- **EASIER SELECTION** and ordering of proper output speed.
- **INCREASED SAFETY**—no moving parts.
- **EASE OF INSTALLATION**—low installation cost.
- **LOW FIRST COST.**
- **LOW MAINTENANCE**—minimum number of working parts.

## HERE ARE REASONS WHY WESTINGHOUSE GEARMOTORS HAVE "WHAT IT TAKES"

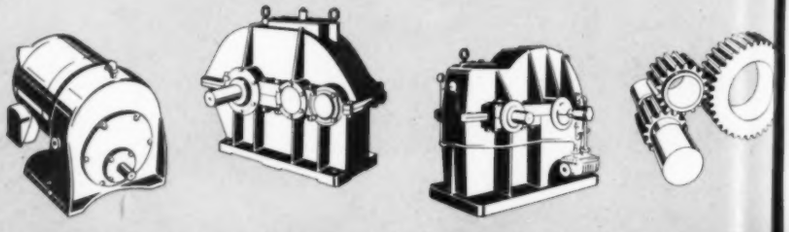
- BPT Gear Steel gears and pinions, exclusive with Westinghouse, have a tapered hardness from surface to core. This results in extremely high impact and wear resistance, assuring maximum load-carrying capacity and long life.
- Gears are produced by precision methods . . . individually checked during each step of manufacture . . . thoroughly inspected and tested to assure high quality. Thus, maximum service life is achieved.
- Positive oil seals keep oil or grease in, keep dirt and dust out.
- Simple, positive lubrication system provides thorough lubrication.
- Antifriction bearings maintain accurate gear centers, reduce friction, prolong service life.
- Parts in all types are readily accessible for inspection or repair.

YOU CAN BE SURE IF IT'S Westinghouse

Litho. in U. S. A.

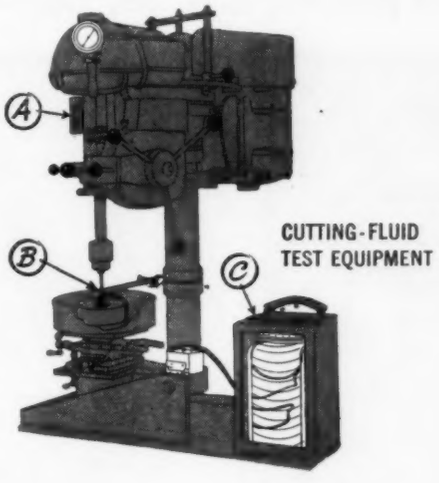
Westinghouse

RPM FITTED DRIVES



GEARMOTORS • SPEED REDUCERS • SPEED INCREASERS • INDUSTRIAL GEARI

## CASE 1046--EVALUATING CALOL CUTTING AND SOLUBLE OILS.




CUTTING-FLUID TEST EQUIPMENT

To determine machining values of Calol Cutting Fluids and help make correct recommendations, Standard's scientists developed a Drilling Torque Tester.

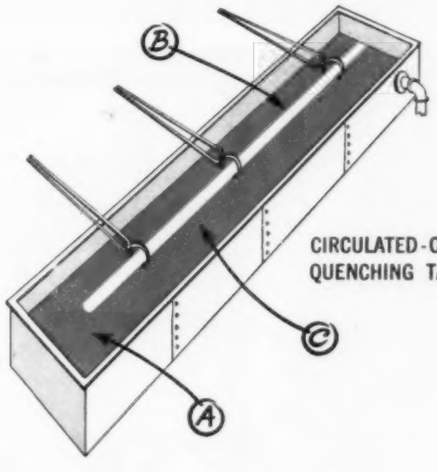
A. Modified drillpress with controlled drilling speeds and feed rate is basic unit.

B. With the Calol Cutting or Soluble Oil to be tested flowing onto a steel test plate, a series of 1-inch-deep holes is drilled into the plate with a precision-sharpened drill. Drill speed is increased 100 rpm for each hole. Test continues until drill fails.

C. Electronic device records the torque curve for each hole. A peak on a curve indicates drill failure. Oils are rated in terms of the speed at which drill failure occurs.

All Calol Cutting and Soluble Oils are given this "breakdown" test. This assures top service from each in the use for which it is recommended -- rapid cooling of tool and work, long tool life and finest possible work finish.

## CASE 1049--PRODUCING UNIFORM HARDNESS WHEN HEAT-TREATING AND QUENCHING STEELS.




CIRCULATED-OIL QUENCHING TANK

When batches of Calol Quenching Oils were used for long periods, analysis of the oils at various intervals showed no sign of oxidation or sludging. Repeated tests made after many months of service proved that uniform hardness of quenched steels was still being obtained, and indicated that the abilities of these oils actually improve with use. Come in two types: Calol Alloy Quenching Oil for all alloy steels having a carbon content of less than 0.50%. Calol Quenching Oil for steels having a carbon content of more than 0.50%.

A. Contain no fatty oils to produce disagreeable odors.

B. High stability helps produce uniform work continuously ... reduces danger of brittleness, distortion and cracking.

C. Practically foam-free at efficient quenching temperatures ... may be used with sodium cyanide or salt without ill effects on oils.

For additional information and the name of your nearest Distributor, write

**STANDARD OIL COMPANY OF CALIFORNIA**

225 Bush Street, San Francisco 20, California

**The California Oil Company**
Barber, New Jersey

**The California Company**
17th and Stout Streets, Denver 1, Colo.

**Standard Oil Company of Texas**
El Paso, Texas

RPM CALOL

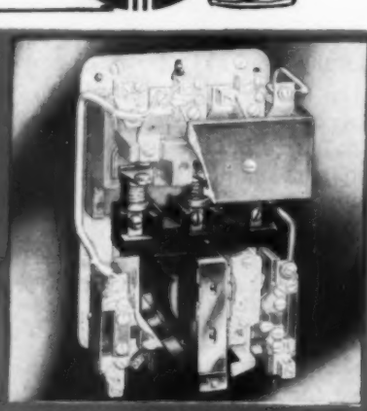
Trademarks Reg. U. S. Pat. Office

# SIMPLICITY IN MAGNETIC

Federal NOARK

**STUDY** the elements of a Federal NOARK Motor Starter; and learn, in 6 quick lessons, why simplified motor control does a better job! You get unfailing overload protection; quick, easy replacement of

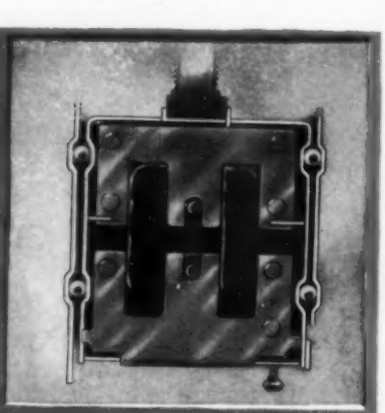
## ONLY ONE MOVING UNIT



LESSON #1

The SINGLE moving unit in Federal NOARK motor controls means less chance for trouble. Greatly simplified, the movable magnet and contact assembly, indicated in dark gray on the illustration, minimizes breakdowns and reduces maintenance costs.

## SMOOTH BALL BEARING ACTION



LESSON #2

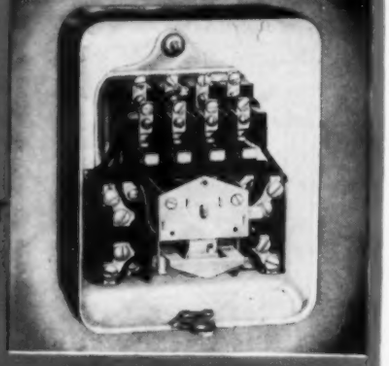
To eliminate friction, the ONLY moving unit in a Federal rides on ball bearings. Raceways guiding the balls are hardened to multiply the life of this moving unit. Mechanical trouble doesn't have a chance to develop in a Federal NOARK Starter.

## AUTOMATIC OR MANUAL RESET

LESSON #5

Another great advantage of Federal NOARK motor controls is the choice of instantly getting either automatic or manual reset. By just turning the readily accessible red knob, you can secure the type of overload protection you want.

## COMPLETE ACCESSIBILITY FROM THE FRONT



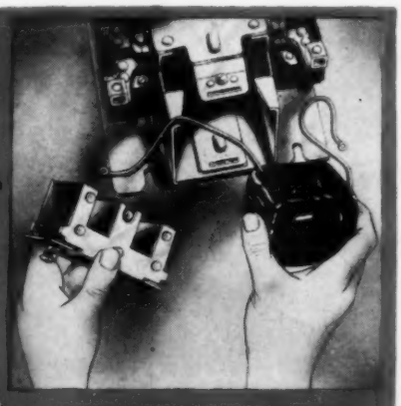
LESSON #6

Armed with a screw driver, you can strip the entire Federal starter mechanism to the base without taking it out of the enclosure. That means that heaters and stationary contacts can also be quickly changed from the front. It's further proof that Federal NOARK motor controls can be quickly inspected and easily maintained.

# MOTOR CONTROLS COSTS NO MORE!

coils and contacts; frictionless solenoid action that sees you through the heaviest production schedules. Federal NOARK gives you rugged, easily maintained motor controls that cost not a penny more.

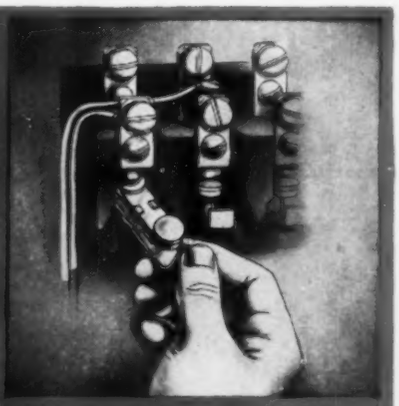
**IMMEDIATE COIL REPLACEMENT**



LESSON #3

Replacing a coil in a Federal NOARK Motor Starter is an A. B. C. operation. A. Press up the coil-retaining spring and pull it out. B. Loosen the screw and lift out the movable magnet. C. Disengage the coil leads and pull out the coil. A new coil goes in place in seconds!

**INSTANT CONTACT RENEWAL**



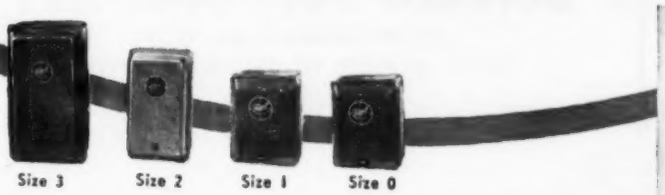
LESSON #4

Renewing double break, solid silver contacts in a Federal NOARK Motor Starter is simple. On size 0 and 1, just press the end of the one-piece contact down and pull; it comes out easily. Slide in a new contact and the job is done. Once in, it can't loosen or vibrate out.

DISTRICT OFFICES IN ALL PRINCIPAL CITIES.

# Federal NOARK

## MOTOR STARTERS



Size 3 Size 2 Size 1 Size 0

FEDERAL also manufactures size 4 and 5 Magnetic Motor Starters. A complete line of Manual Starters . . . Magnetic Contactors . . . Combination Motor Starters . . . Reversing Contactors and Starters . . . Combination Reversing Starters . . . Magnetic Multi-Speed Starters . . . Reduced Voltage Magnetic Starters . . . Automatic Transfer Panels.

**FREE!**

Federal NOARK Motor Control folder and FEDERALOG (Outlining the complete Federal NOARK line)

SEND THIS COUPON TODAY!

**Federal Electric Products Company**
**50 Paris Street**
**Newark 5, New Jersey**

Please send me free copies of the Federal NOARK Motor Starter folder and the Federalog.

NAME .....

ADDRESS .....

CITY ..... STATE .....

EXECUTIVE OFFICES: 50 Paris Street, Newark 5, New Jersey. PLANTS: Hartford, Conn., Newark, N. J., St. Louis, Mo., Long Island City, N. Y.

This Head is askew

These Threads are eccentric

These Heads and Threads are true

**Circle Ⓑ Bolts and Nuts . . . both standard and special . . . are used in large volume by leading manufacturers of quality products. The dependability of these bolts has been tested time after time and proven in thousands of applications.**

**BUFFALO BOLT COMPANY**
**North Tonawanda, N. Y.**
**SALES OFFICES IN PRINCIPAL CITIES**
*Export Sales Office: Buffalo International Corp., 50 Church Street, New York City*

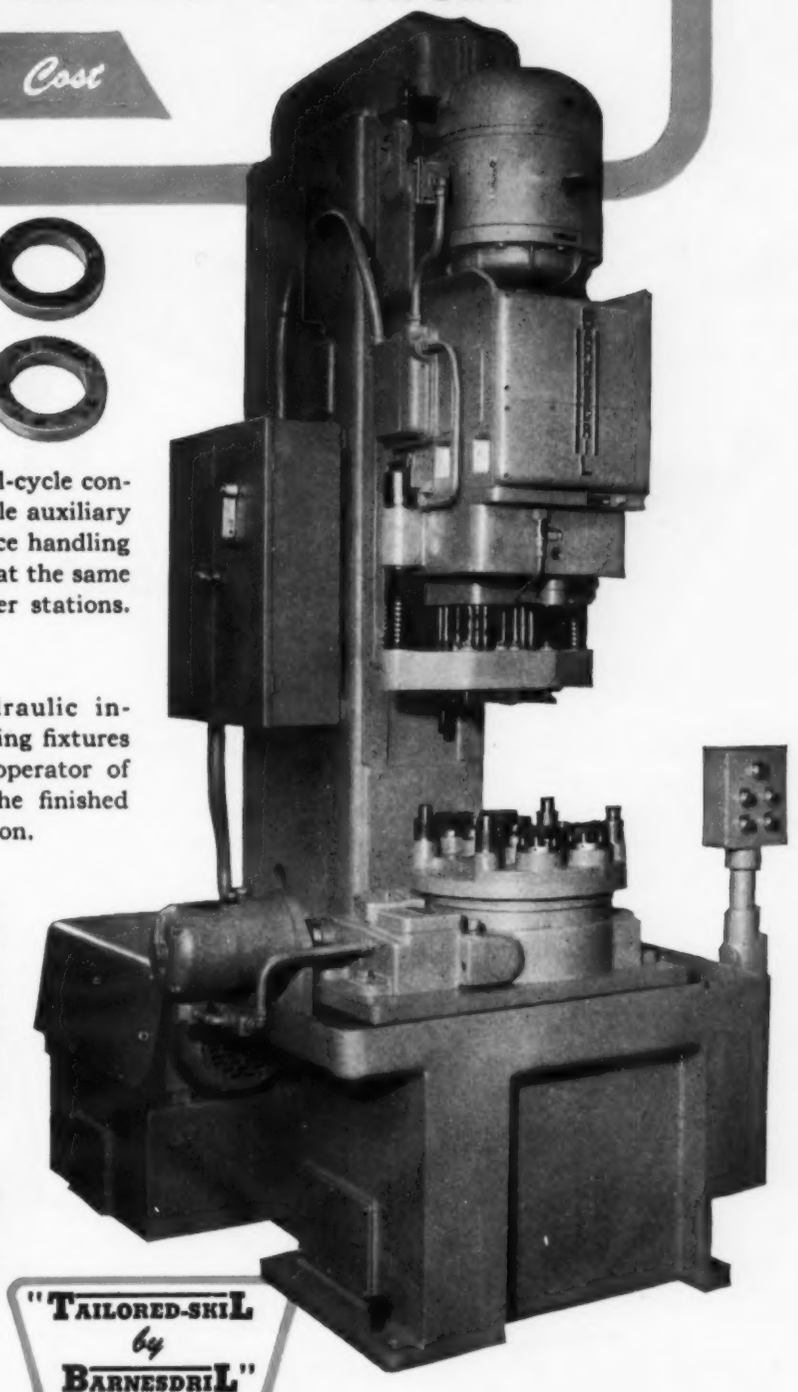
...they are CIRCLE Ⓑ BOLTS

BARNESDRIL *Unit Type Machine*

# Drills 26 Holes

## PER LOAD OF 4 PIECES

*Faster, Easier, with Less Cost*



**Faster** Engineered timed-cycle control and 26-spindle auxiliary drilling head have eliminated individual piece handling and idle machine time. All holes are drilled at the same time, while loading is going on at the other stations. Output is 480 pieces per hour.

**Easier** Automatic hydraulic indexing, self-locating fixtures and automatic cycling have relieved the operator of all manual movements except removing the finished pieces, and dropping new blanks into position.

**Less Cost** This combination — timed-cycle control; reduced non-machining time; progressive machining of separate parts and separate operations at the same time — is producing 480 pieces per hour from one machine. Best previous time was 200 pieces of each part per hour from 2 machines.

Send for additional information on BARNESDRIL Unit-type production methods for other work including reaming, tapping, threading, facing, counterboring or milling operations. Ask for Bulletins B1504 and B34.

"TAILORED-SKIL by BARNESDRIL"

**BARNES DRILL CO.**

830 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

# Quality finishes have Bonderite under the paint

Finest finishes are applied after Bonderizing. Automobiles, kitchen equipment, washers, ironers, dryers, tractors and garden tools, lawnmowers—the list could go on to include almost every type of painted steel article on which lasting appearance is important.

The Bonderizing process prepares metal to take and *hold* paint. It resists corrosion, confines damage from scratches and dents to the injury itself.

Bonderizing costs little, is simple to operate, easy to control, positive and uniform in results.

Bonderizing under the finish helps keep the customer satisfied by protecting and preserving paint appearance and service life.

Your letter or card will bring you full information. Write today.

*Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.*

PARKER

PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

**BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces**

CAPACITY:
Profiles up to 6" in length. Circular work up to 4" in diameter. Flat pieces up to 2" in thickness.

TUNGSTEN CARBIDE can also be ground on this machine.

Get accuracy to 0.0002" on tools, gages, dies, templates and all types of small parts! The Studer Profile Grinder saves time by grinding parts complete in one operation – with one wheel, eliminates preliminary grinding to form on many small profiles. Write for complete information.

**COSA CORPORATION**

Representing STUDER in United States and Canada

624 Chrysler Building New York 17, New York

# Central system clarification of coolants gives.... 6 money-saving advantages

A central system featuring Honan-Crane Automatic Clarifiers and Houdaille Conveyors delivers a continuous flow of clean coolants to any number of machine tools. Chip and contamination disposal problems are fully solved. Operating economies more than justify the expenditure for this equipment.

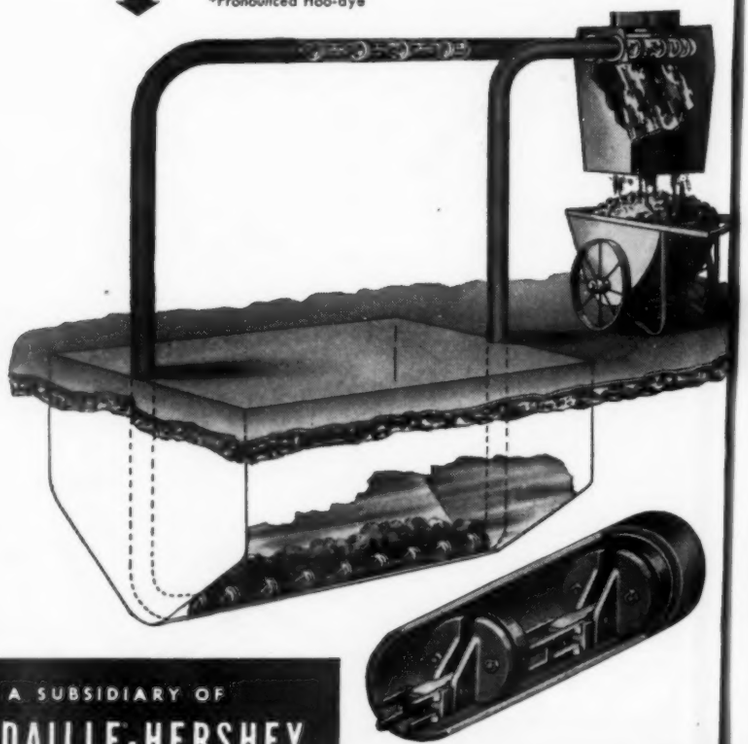
*NOTE: Other types of central systems for cutting oils, hydraulic oils, rolling mill oils, etc., feature Honan-Crane Purifiers, Filters and other items of equipment. Write for case histories on actual installations.*

1. Increases tool life
2. Eliminates Individual machine tool coolant pumps and motors
3. Better finishes with fewer rejects
4. Eliminates labor necessary to clean individual machine tool sumps and lines
5. Extends coolant life thereby relieving disposal problems
6. Better control of Dermatitis problems

**HONAN-CRANE AUTOMATIC CLARIFIER** . . . This clarifier removes abrasives, dirt and other solid contamination from water soluble coolants used for grinders, broaches, boring machines, milling machines and other metal working machine tools.

**THE *Houdaille CONVEYOR** . . . This effective conveyor is the final step in eliminating manual labor requirements for oil and coolant clarification systems. The chain and flights which travel through standard 2", 4" or 6" pipe are routed along the bottom of a V-shaped settling tank. An open section of pipe is employed at this point. Chips, sludges and other contaminants are collected, as they settle, and are transported over any required route of travel to a hopper for disposal. A sludge cart may be used to move the sediment for final disposition. Flights are neoprene, steel backed. The conveyor is driven by an electric motor, through reducing gears.

*Pronounced Hoo-dye



# HONAN-CRANE CORP.

205 WABASH AVENUE • LEBANON, INDIANA

☐ Please send actual case histories on Central Systems for

_____ for _____
(Oils or Coolants) (Type of operation)

☐ Please send complete information on Automatic Clarifier

☐ Please send complete information on Houdaille Conveyor

☐ Please have a salesman call

Name _____

Company _____

Address _____

City _____ State _____

A SUBSIDIARY OF
HOUDAILLE-HERSHEY

# Sterling

"The Wheels Of Industry"

## Tool and Cutter Sharpening Is Quick and Profitable With Sterling Grinding Wheels

● Today, toolroom grinding demands specialized wheels built to the needs of each individual job. Sterling meets this demand with grinding wheels of proper grain-size and hardness to remove stock quickly and without burning. Literally thousands of tricky toolroom grinding problems have been solved by Sterling's "Wheels of Industry."

Resharpening tools and cutters often means reduced tool and production costs. Specifying Sterling Toolroom Grinding Wheels means quick, clear-cutting action on any alloy, regardless of its toughness.

A Sterling engineer is ready to apply the correct type to your troublesome job. Ask about Sterling Toolroom Grinding Wheels.

• A complete listing of the correct Sterling Wheels for toolroom grinding jobs is available in this interesting folder. Ask for your copy.

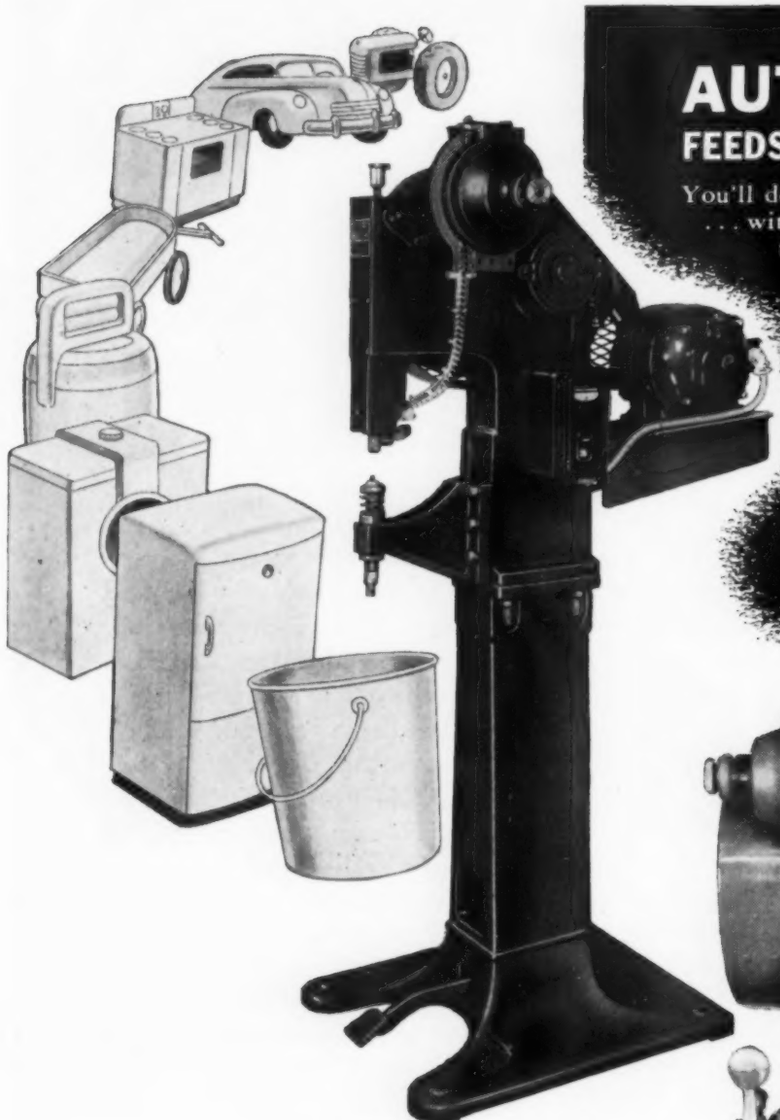
• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

## *Save* RIVET-SETTING *Time!*... CUT COSTS with

# T-J *Rivitors*

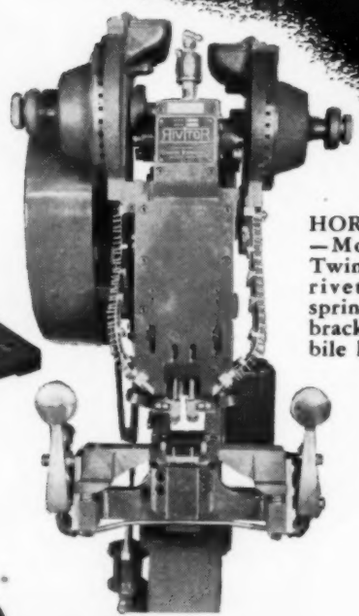


MODEL R RIVITOR — Automatically feeds and sets solid steel rivets 1/16" to 1/4" dia. incl. and up to 3/4" incl. long.

## AUTOMATICALLY
### FEEDS AND SETS SOLID RIVETS

You'll do a better job of rivet setting . . . faster . . . with T-J Rivitors! Tests show that with the Rivitor you get a solid rivet joint of 10% to 15% greater strength—a completely filled hole . . . no flashing . . . a neat, balanced head. Geared to speed and accuracy—the T-J Rivitor fits into today's tough production schedules.

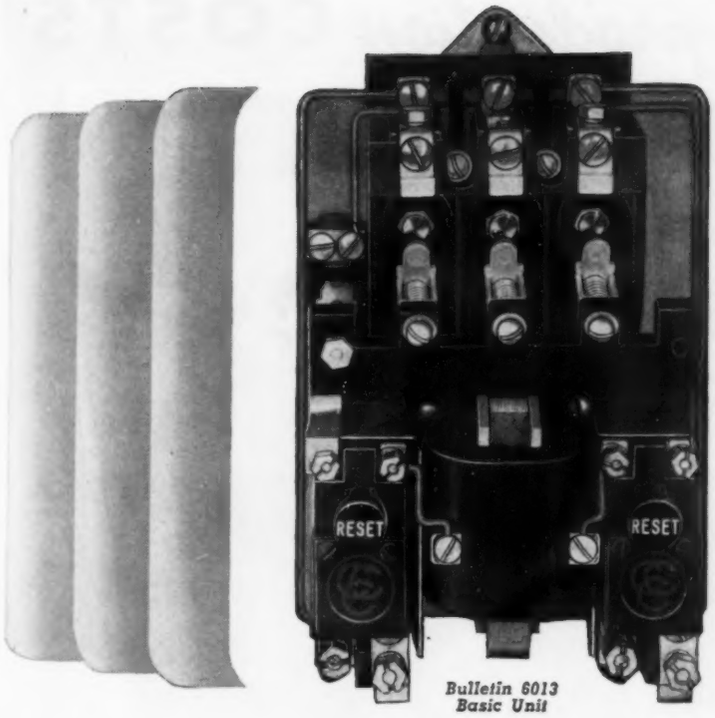
The Rivitor cuts costs by using solid rivets instead of more expensive types. Wide range of uses. Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.



HORN BRACKETS — Model RR 1221 Twin Rivitor used for riveting flat steel springs to mounting brackets for automobile horns.

**31 YEARS EXPERIENCE**

**T-J TOMKINS-JOHNSON RIVITORS**




*Bulletin 6013 Basic Unit*

# There's a CLARK ACROSS-THE-LINE STARTER AND ENCLOSURE

## For Every Industrial Condition

Shown above is the basic unit of CLARK Bulletin 6013 AC Magnetic, non-reversing, Across-the-line Starters. It provides full voltage starting and overload protection for squirrel cage motors and can be used as a primary switch for wound rotor induction motors.

This starter consists of a CLARK Bulletin 7707 Contactor with double-break silver-to-silver contacts and CLARK Bulletin 7323 Overload Relays which open the contactor coil circuit when an unsafe overload occurs. Contactor and Overload Relays are mounted on a steel mounting plate which is easily removed for service.

### *Enclosures to meet Every Operating Condition*

Form MA, MB and MC starters have heavy steel enclosures, with provisions for locking.

*Form MA* has reset button on cover for externally resetting the overload relay. A separate push button or other pilot device is required for starting.

*Form MA Starter*

*Form MB* provides a "Hand-Off" Automatic selector switch and external reset button. It is used with separate 2-wire pilot devices such as float switches, thermostats, etc.

*Form MB Starter*

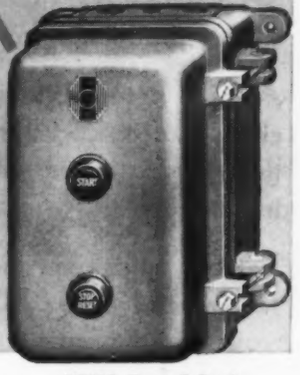
*Form MC* provides external "Start" and "Stop" buttons, the "Stop" button is also the "Reset" button for external resetting. Separate push buttons are not required for starting, but may be used if desired.

*Form MC Starter*

*NEMA Type 7* Enclosures for Class 1, Group D Hazardous locations are available for locations where atmosphere contains gasoline, petroleum, naphtha, benzine, alcohol, acetone, lacquer, solvent vapor or other gases from volatile liquids.

*NEMA Type 7 — for Class 1, Group D Hazardous Locations*

*NEMA Type 4 Water-Tight*, and *NEMA Type 5 Dust-Tight* Enclosures have gaskets which seal them effectively against moisture or non-explosive dust conditions.




*NEMA Type 5 Dust-Tight and NEMA Type 4 Water-Tight*

*Write for CLARK Bulletin 6013*

**THE CLARK CONTROLLER CO.**

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

# *Cut your climbing production* COSTS

## with GARDNER *Double* GRINDING

BY precision-grinding TWO sides with ONE pass through the machine, GARDNER semi-automatic *Double* GRINDERS are cutting production costs on many parallel-surface parts.

Above, automobile gear blanks are gravity-fed from an inclined chute into a feeder, having rubber rolls front and rear, that carries the gears in a constant stream between two opposed 30 inch grinding wheels. High production — close accuracy!

Let our engineers study *your* parallel-surfacing requirements — and recommend a GARDNER Double GRINDER that will cut down your grinding costs — or

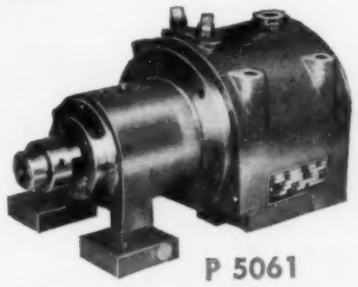
**WORK DATA**

Part *Gear Blanks from 3" to 6 5/16" O.D.*
Material *Steel*
Operation *Grind Two Sides*
Tolerances *.0004" for Parallelism; .001" for Uniformity.*
Stock Removal *.002" to .004" Maximum Overall*
Production *20 to 30 Pieces per Minute, Per Cut*
Feed *Hand Load to Chute; Gravity Unload*
Machine *No. 84B-30" Gardner Double Grinder*

**Write for GARDNER *Double* GRINDING Bulletin!**

GARDNER-GRIND YOUR *Flat* SURFACES

**GARDNER MACHINE COMPANY**
410 East Gardner Street . . . . Beloit, Wisconsin, U.S.A.



P 5061

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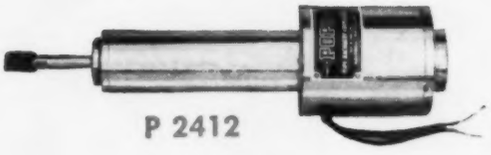


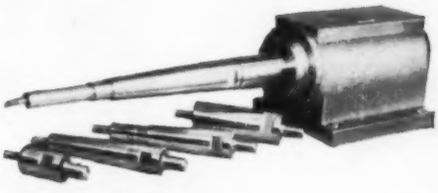
P 2412

# POPE

## DESIGNS AND BUILDS SPECIAL SPINDLES

Engineered to meet your particular spindle requirements–equipped with Pope *Sealed Lubrication* or *Oil Mist Lubrication,* according to the requirements—constructed by master craftsmen to meet the standards of precision, performance and lasting dependability that distinguish *all* POPE Spindles. Write for recommendations and estimates.

P 5781-2



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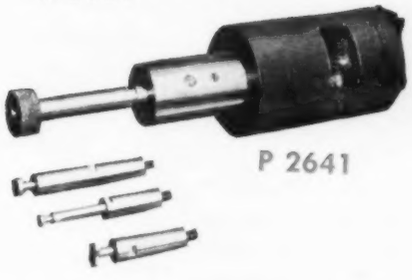


P 2641

No. 54

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

# *In this method*

## of Tool and Die Making —you Buy Less Steel and Reduce Machining Costs

**Write for New Booklet:**

**CAST-TO-SHAPE**

**TOOL STEEL**

Gives you full details on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties capable of saving you time and money.

**Get Your Copy— Write for it Today**

**ADDRESS DEPT. AM-79.**

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

**ALLEGHENY LUDLUM**
**STEEL CORPORATION**
**Pittsburgh, Pa.**

*Forging and Casting Division*

**DETROIT 20, MICHIGAN**

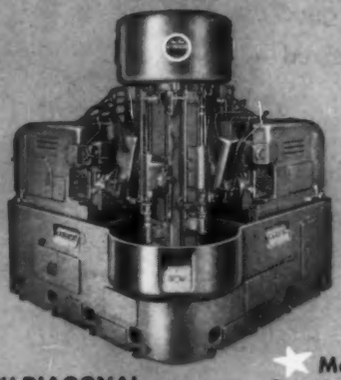
W&D 1696

# Red Ring Rotary Gear Shaving Machines

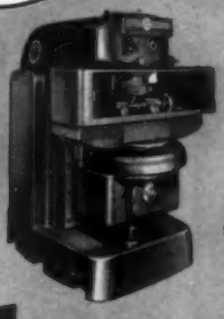
## FOR SPUR AND HELICAL GEARS

★ The Elliptoid tooth form may be shaved on these machines.

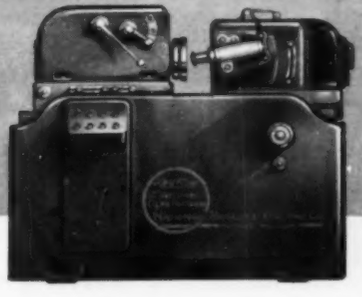
Model GCL FINE PITCH SHAVER for external gears 3/16" to 4" PD.



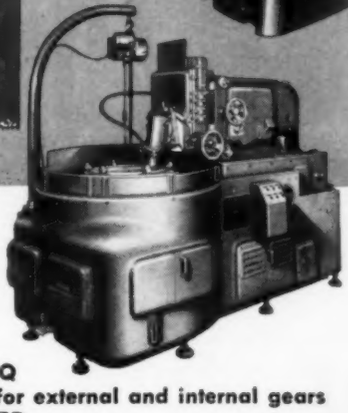
★ Model GCU DIAGONAL (2 Sizes) for external gears from 1" to 12" PD.



★ Model GCS TURMATIC (2 Sizes) for external gears ¾" to 12" PD.



Model GCR for internal gears 3" to 12" PD.



Model GCQ (3 Sizes) for external and internal gears 5" to 48" PD.

★ Models GCI (3 Sizes) for external gears ½" to 18" PD and internal gears 3" to 18" PD.

★ Model GCP for external gears 3" to 24" PD.

★ Model GCJ for external gears 4" to 36" PD.
Model GCM (2 Sizes) for external gears 4" to 48" PD.

Model GCK (2 Sizes) for external gears 24" to 160" PD.

*Write* for descriptive bulletin on the machine in which you are interested.

**NATIONAL BROACH AND MACHINE CO.**
5600 ST. JEAN • • • • • • • DETROIT 13, MICHIGAN

## NOT A CLAIM . . .
## BUT A PROVEN FACT

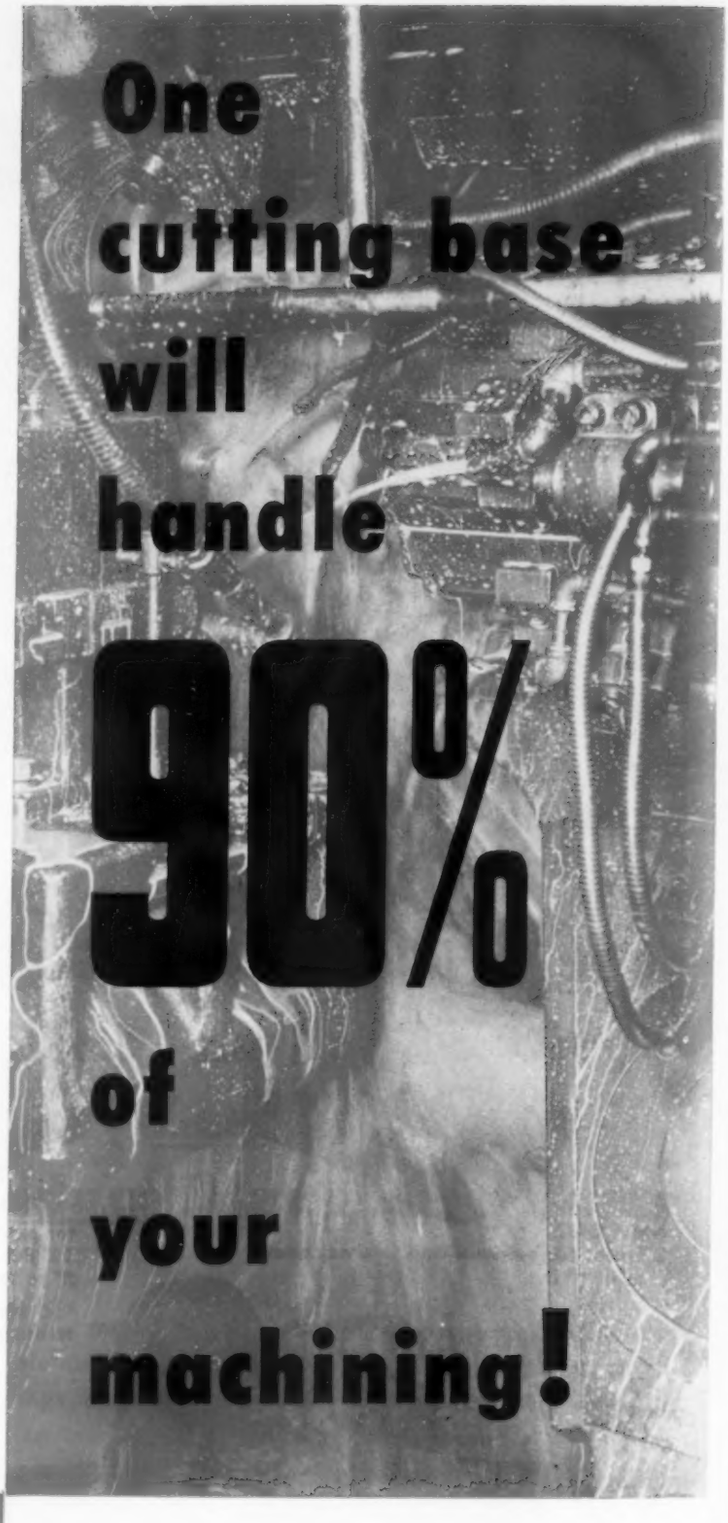
A few short months ago Houghton announced the "biggest news in cutting coolants since 1915."

It was Antisep All-Purpose Base—possessing all the qualities of all the good cutting fluids you've ever used—a hundred oils wrapped up in one!

It's easy for us to be enthusiastic about this cutting base, because we've watched it spread from one operation to another in a goodly proportion of the country's largest and fussiest machine shops. They try it on one or two machines, and before you can say "Antisep All-Purpose Base" they've put it in every type of machine tool.

Here is a base miscible with either oil or water . . . high in fatty oil content . . . possessing a higher film strength than most lubricants . . . antiseptically treated . . . safe for automatics . . . providing cool work, finely finished, with lengthened tool life.

One can hardly ask for more. When you want factual proof and price, please write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Pa., or ask the Houghton Man who calls on you.




Houghton's
ANTISEP
All-purpose Base

**Soluble in both oil and water. High in fat content and film strength. Excellent for drawing, too!**

# "CHEAP" TOOLS *shackle* INDUSTRY AND TRADE

*Use of "cheap" metal-cutting tools proves the adage of "Penny Wise, Pound Foolish". Their performance is unreliable and inconsistent.*

*Use of cheap money tools has likewise proved to be "Penny Wise, Pound Foolish". Their purchasing value is uncertain and erratic.*

Sound, durable cutting tools are worth the price. A few pennies additional first cost will save dollars of ultimate cost—in grinding, tool inventory, set-up time, and idle machine time, with the result that production is reliable and sustained.

Innumerable performance records continue to demonstrate the superior worth of Kennametal tools in their ability to reduce over-all costs for tooling and production — and do this consistently. Kennametal has an extra measure of value. Exclusive processing, scientifically controlled, assures maintenance of a sound physical structure having trustworthy properties of high hardness and great strength.

* **Bill H. R. 5031** introduced into the House of Representatives, January 20, 1948, by Congressman Buffet of Nebraska cited as the "Gold Standard Act of 1948."

**A BILL**

"To restore the right of American citizens to freely own gold and gold coins; to return control over the public purse to the people; to restrain further deterioration of our currency; to enable holders of paper money to redeem it in gold coin on demand; to establish and maintain a domestic gold coin standard; and for other purposes."

Sound money is a trustworthy tool of measurement that serves to evaluate accurately the relative worth of goods and services in all sorts of exchange activities. With a stabilized currency an individual knows assuredly the worth of his earnings and reserves — savings, insurance, pensions. A businessman is able to make firm, fair contracts, meet current and future obligations with certainty, and engage safely in creative ventures.

Innumerable historic examples have proved that the convertible Gold Standard is the most useful money system ever devised. Managed currency, initiated 15 years ago in the United States, has impaired our money tool and made it untrustworthy. A return to the historic honest dollar, as proposed in a bill now before Congress*, will have a stabilizing effect on our economic life.

*While you are waiting for the return of 100 cent dollars, Kennametal tools, of premium value, are waiting for you. They are one technological development that can help mitigate the ill effects of inflation.*

# WASTE DESTRUCTIVE HEAT!

# SAVE PRODUCTION TIME!

HARRISON OIL COOLERS
FOR
INDUSTRIAL APPLICATIONS

**Engineers recognize the need of *wasting* heat, as well as *utilizing* heat. Harrison Oil Coolers *waste* heat efficiently, thus insuring uninterrupted production, and lengthening machine life. Consult Harrison engineers.**

HARRISON

**HARRISON RADIATOR DIVISION OF GENERAL MOTORS CORPORATION, LOCKPORT, N. Y.**

finishes?

drawing properties?

tolerances?

# KHP ALUMINUM...

surface appearance?

## ...meets the most exacting specifications

Whether the emphasis be on drawing properties, tolerances, finish or surface appearance, it's KHP for aluminum. Specify KHP aluminum for *your* operations, and be assured of consistent quality and dependable deliveries. Our metallurgical department is always ready to serve you—may cut your costs through sound advice. Call us today.

KHP ALUMINUM

*KHP PRODUCTS ARE: Cold rolled and hot rolled strip—shim—sheet steels • Annealed spring steels • Tempered and polished spring steel • Tempered feeler gauge steel • Cold finished bars • Drill rod • Electrical sheets • Precision tubing—cold drawn seamless—welded—stainless and alloy tubing • Aluminum strip and sheets • Extruded aluminum and magnesium tubing—shapes—mouldings • Rolled magnesium plates • KHP SERVICES: Edge rolling • Slitting • Square shearing • Flattening, straightening, cutting.*

**KORHUMEL • HEFFRON & PREISS STEEL CO.**

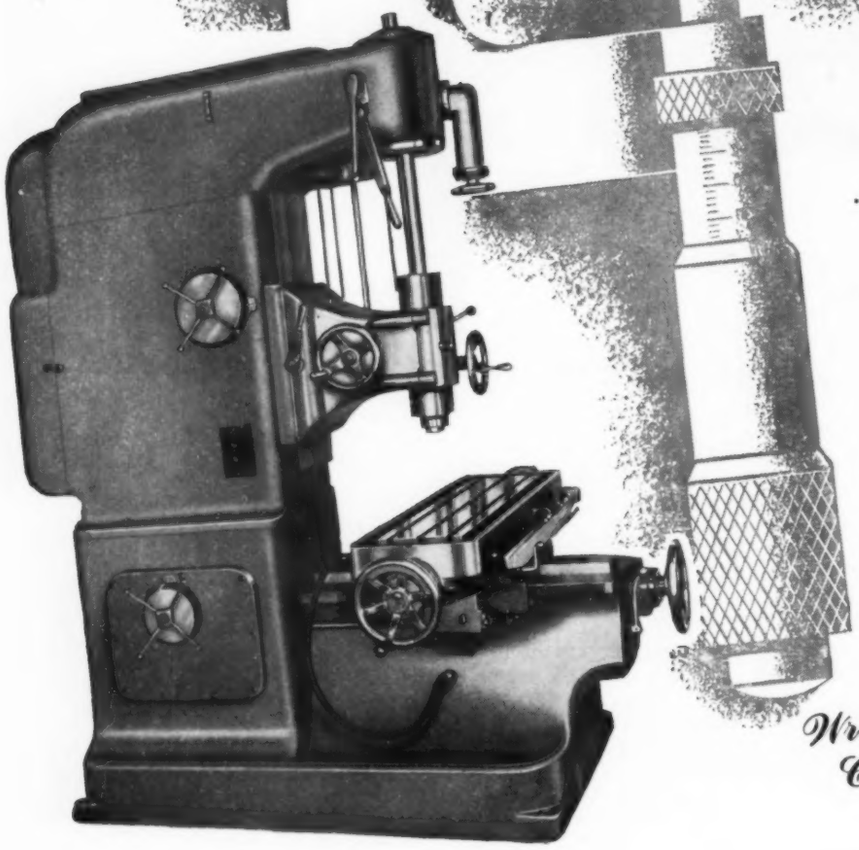
2426 Oakton Street • Evanston, Illinois • AMbassador 2-6700
Rockford Phone Enterprise 1266 • Teletype Evanston 1675

WAREHOUSES: MINNEAPOLIS · MILWAUKEE · MT. VERNON, N.Y. · SALES OFFICES: DETROIT · ST. LOUIS · LOS ANGELES

# EXCEPTIONAL ACCURACY, SPEED AND POWER

## No. 50 PRECISION BORING AND VERTICAL MILLING MACHINE

★ Reduces Set-Up Time To A Minimum
★ Eliminates Time-Wasting Work Transfers
★ Multiple Operation On A Single Machine
★ Greater Output At Lower Unit Cost



The No. 50 is a machine built for precision as well as speed . . . with unusual ability to handle an extreme range of different and difficult jobs. Simple and convenient to operate — ruggedly constructed for many years of tough, trouble-free service — the Knight Miller offers worthwhile savings in greater output, lower production costs and improved quality of work.

*Write for Complete Catalog Details*

Sixteen spindle speeds, 40 to 2,000 r.p.m. • 9 spindle feeds, .005" to .010" • 100" table traverse per minute in both directions • Sixteen table feeds, $\frac{5}{16}$" to 20" per minute • 7½ h.p. drive.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

# W. B. KNIGHT
## MACHINERY COMPANY

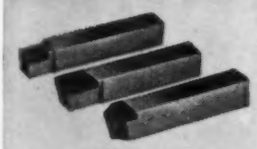
*MORE GOODS for MORE PEOPLE at LOWER COST*

3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

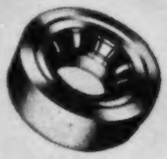
# 1 POUND to 1000 POUNDS

# Talide
(TUNGSTEN CARBIDE)
## Work Rolls

TALIDE METAL MEETS EVERY REQUIREMENT



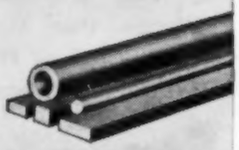
CUTTING TOOLS



DRAWING DIES

CENTERLESS BLADES

DRILL JIG BUSHINGS



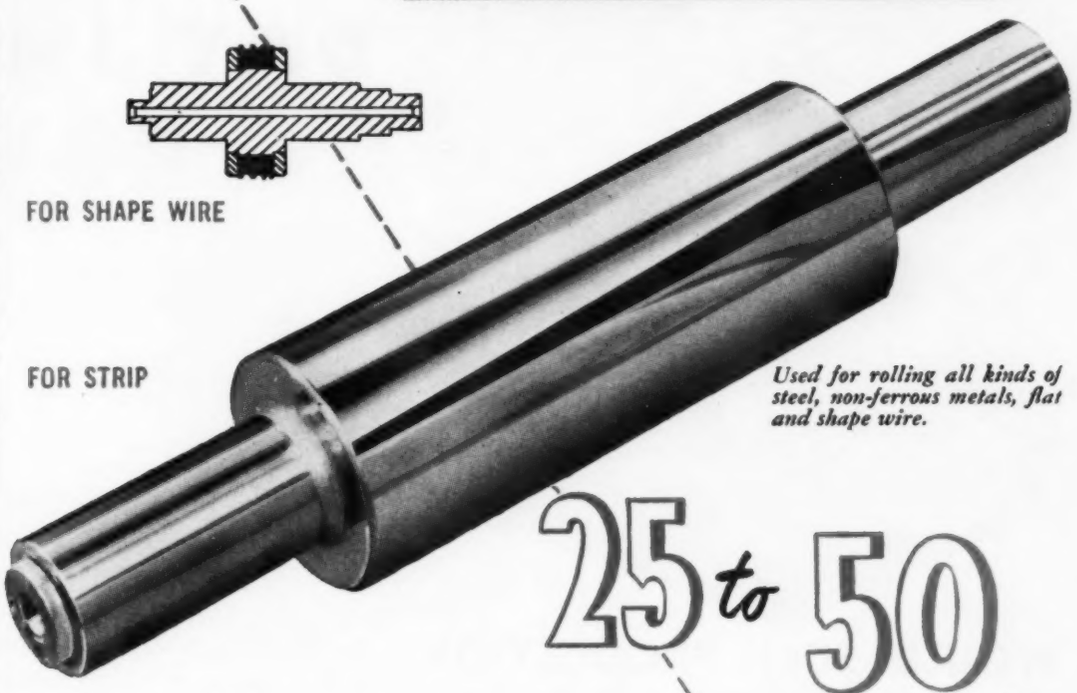
SOLID BAR STOCK

FOR FLAT WIRE



FOR SHAPE WIRE

FOR STRIP



*Used for rolling all kinds of steel, non-ferrous metals, flat and shape wire.*

# 25 to 50
# times more work per grind

This solid tungsten carbide (Talide Metal) roll is the largest product ever made of tungsten carbide. Solid or sleeved, carbide rolls are an exclusive development of Metal Carbides Corporation . . . diameters up to 10" and lengths up to 40". Much harder than the hardest steel rolls, carbide rolls take and impart a mirror-like finish to the metal rolled. On production, mills report 25 to 50 times more service life per grind.

OTHER ADVANTAGES INCLUDE:

| | |
|---|---|
| MORE PRODUCTION | CLOSER TOLERANCES |
| HIGHER SPEEDS | GREATER REDUCTIONS |
| LESS DOWN TIME | FEWER REJECTS |

Carbide rolls can be reground twice as many times as steel rolls. Improved physical properties of the strip reduce cost of subsequent plating and stamping operations.

*Send for Circular on* TALIDE ROLLS

SINTERED CARBIDES — MC TALIDE — HOT PRESSED CARBIDES

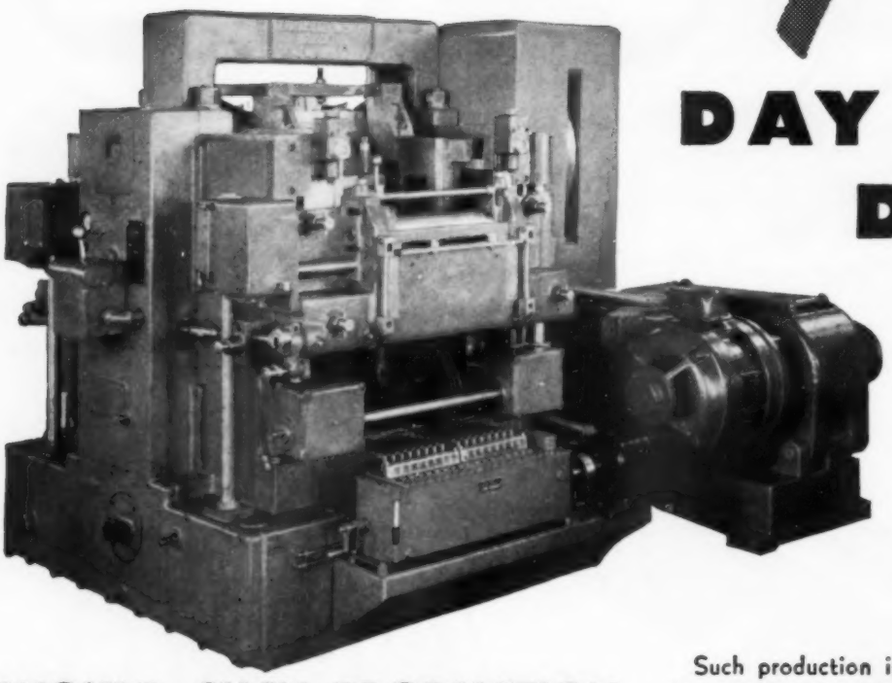
**METAL CARBIDES CORPORATION**

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS — DRAWING DIES — WEAR RESISTANT PARTS

# 800 STROKES/min.

## DAY IN - DAY OUT



## WOULD SUCH PRODUCTION HELP CUT YOUR COSTS?

Figure out for yourself what production records like these could do to your costs on blanking and piercing operations:

*One company - 2000 blanks per minute consistently for years.*

*Another big manufacturer - ONE MILLION laminations for aircraft generators on a SUPER SPEED in a 48-hour week with only one operator.*

*Again, SUPER SPEED turns out 120,000 pieces per 8-hour day compared to 50,000 with a regular punch press equipped with automatic feed and to 9,000 with a hand-fed punch press.*

Such production is revolutionary. The FERRACUTE SUPER SPEED PRESS is itself revolutionary, the die bed reciprocating in a horizontal plane and the punch member taking its motion direct from the crank shaft. There is no lost motion because the material moves continuously while the work is being performed. Production speeds are limited only by the physical characteristics of the product and the maximum speed of the machine. FERRACUTE SUPER SPEED takes standard die sets, reduces die costs because of less frequent grinding. Has worked successfully a considerable variety of metals: electrical grade steel, cold rolled steel, nickel alloy steel, brass, copper, etc. Feed by coil or strip. Models from 250 to 1000 RPM. Write for full details.

# SUPER SPEED PRESS

FERRACUTE

**MACHINE COMPANY**

*Super Speed Press Division* **BRIDGETON, N. J.**

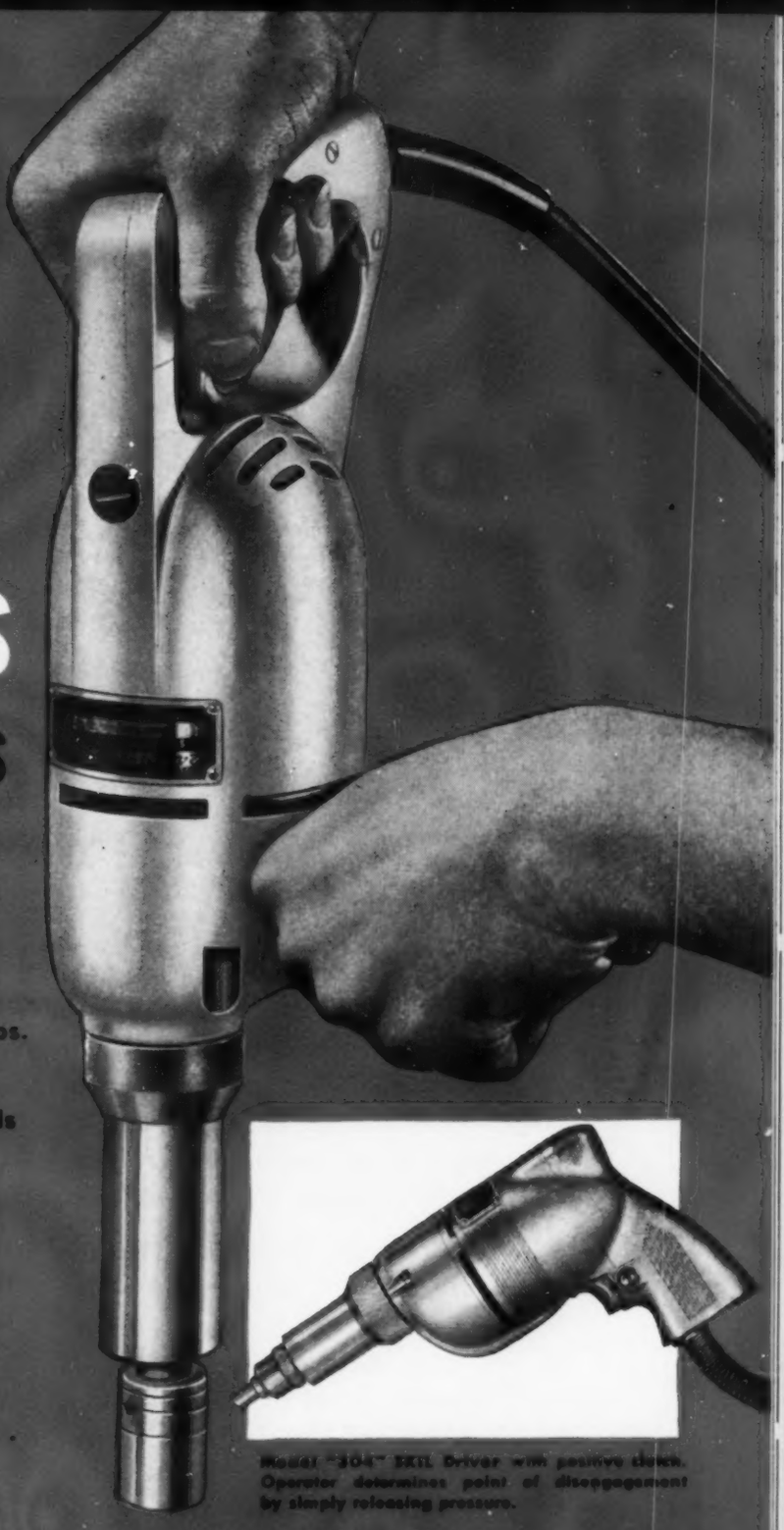
For 85 years, manufacturers of Power Presses, Press Brakes and Special Machinery

Save seconds at every turn...

# Put SKIL Drivers to work driving screws and running nuts!

Here's how to tell whether SKIL Drivers will really pay for themselves on your assembly jobs. Figure how many nuts must be run . . . how many screws must be driven. Then multiply by the seconds you'll save on every one when SKIL Drivers take over. You'll find you're figuring in hours and *dollars* before you know it.

SKIL Drivers bring you these big savings because they're extra fast. They're small and compact for use in tight corners . . . lighter and more perfectly balanced for easiest handling . . . and sturdily built for *all* your jobs. Ask your SKIL Tool Distributor for a demonstration today!





Model "304" SKIL Driver with positive clutch. Operator determines point of disengagement by simply releasing pressure.

Model "303" SKIL Driver has adjustable clutch that disengages on predetermined torque. Tension easily adjustable in seconds.

SKILSAW, INC., 5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada:
SKILTOOLS, LTD., 66 Portland St., Toronto, Ont.

SKIL ELECTRIC Tools PNEUMATIC

TRADE-MARK

# INTRODUCING THE REDUCEROLL

The Reduceroll, latest addition to the line of National forging machinery, pre-forms blanks preparatory to forging in presses, hammers or forging machines.

The Reduceroll accurately distributes the stock throughout the length of the blank free of shuts or folds by rolling. The result of this unskilled operation is the reduction of flash to a minimum without the necessity of performing the costly time consuming fullering and edging operations now necessary on numerous forging jobs.

Available in five sizes covering a wide range of forging work, the new Reduceroll will greatly reduce material, labor and die costs on a substantial proportion of forging jobs.

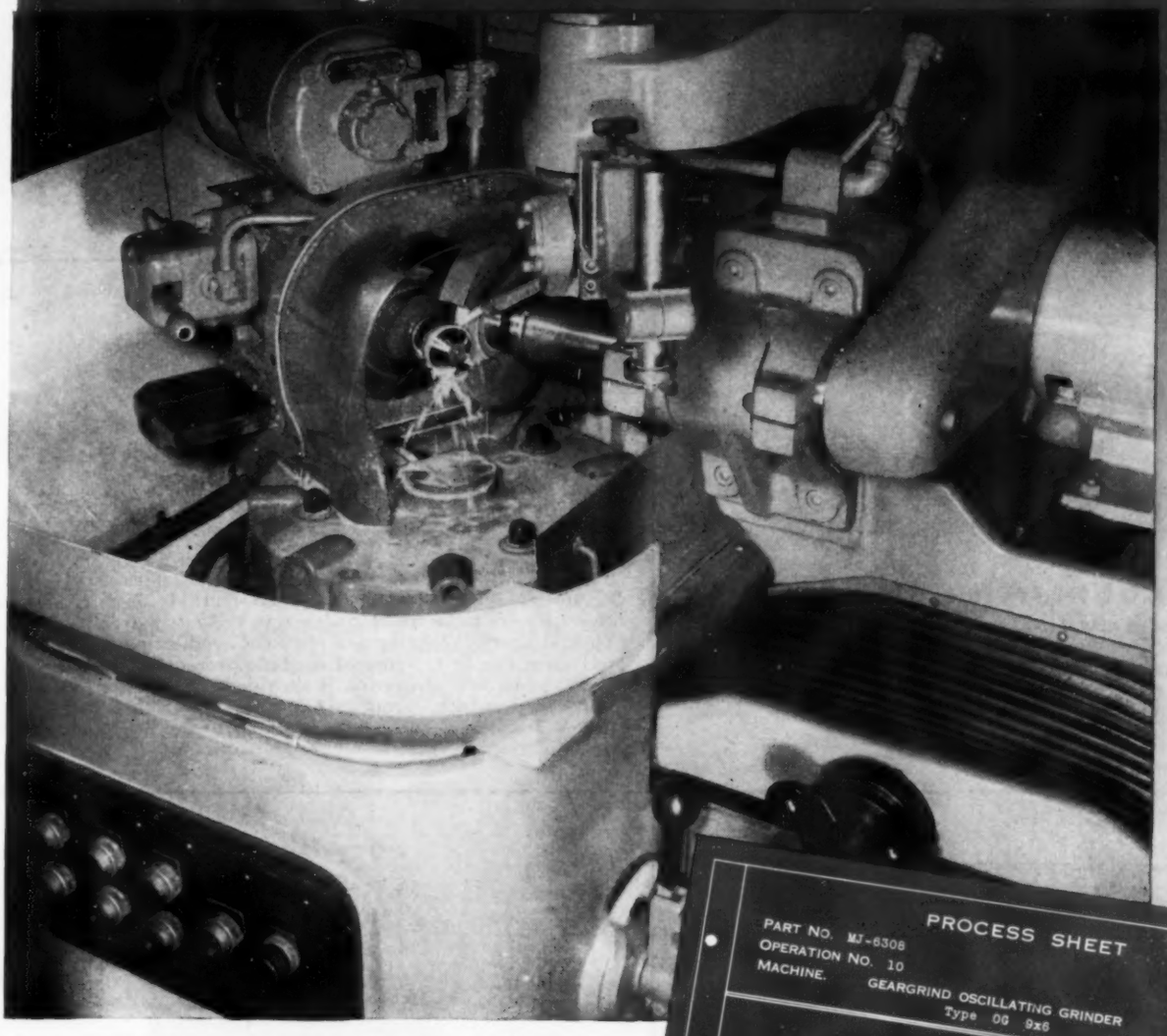
We welcome the opportunity to help you investigate the application of Reducerolling to your forging jobs.

**NATIONAL**
**MACHINERY COMPANY**
TIFFIN, OHIO

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

# GEARGRIND
# *Spherical Grinding*
## *for* PRODUCTION



Automatic feed takes the Geargrind Universal Oscillating Precision Grinder out of the tool room or experimental shop and puts it in the production line.

It delivers extreme accuracy and fine finish at lower costs. It may be equipped to handle production grinding of any of the following types: generated external and internal spherical surfaces, annular ball bearing races and barrel shaped surfaces.

**WRITE** Complete specifications and full information on request. Tell us about your job.

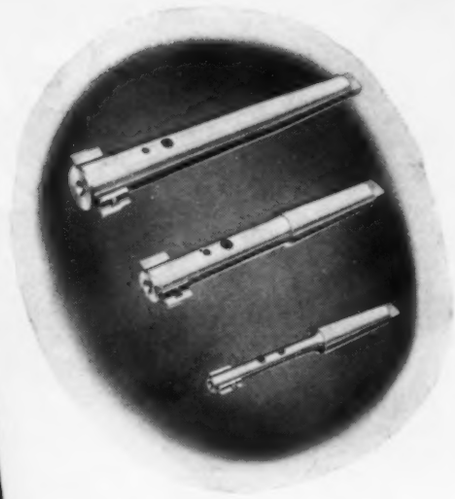
The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

### BALL STUD AS SHOWN

*Operation:* Grinding spherical surface.
*Size:* 1.6780"-1.6783" spherical diameter. Maximum deviation from true sphere .00005".
*Normal Stock Removal:* .008" on diameter.
*Finish:* 12 micro.
*Pieces per Hour:* 53, at 85% efficiency.

# 4 REASONS WHY MADISON REAMERS CUT TIME AND COSTS

The simplified design and operational features of Madison Production Reaming Tools will enable you to cut your reaming time and hole costs to the minimum. Easy to adjust, to maintain and always aligned, the free, smooth cutting action of Madison Reamers has provided the answer to industry's need for greater speed and economy in reaming operations. Check the four reasons for Madison efficiency listed below.

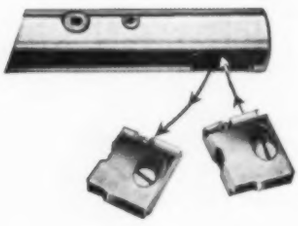


## MIRROR-SMOOTH FINISH

The cutting blades of a Madison Reamer produce a mirror-like finish that in most cases does not require an additional finishing operation. Since Madison cutters are pre-sized, any number may be stored in a crib. The Madison one-screw adjustment feature insures that both blades always cut, by eliminating possibility of unequal cutter blade expansion.

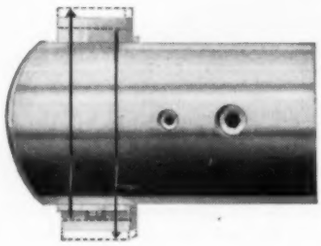
## BETTER CHIP CLEARANCE

Because Madison Reamers have no multiple inserted blades, there is more room for chip clearance and circulation of coolant. Thus, danger of clogging and resultant overheating is eliminated, and shrinking or tapering of the hole prevented. Further insurance against hole distortion is provided by Madison's freer cutting action, which permits work to be held very lightly. This makes Madison Reamers ideally suited to the machining of the new, lightweight metals.



## INTERCHANGEABILITY

Since Madison cutters are pre-sized, they are interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. Keeping a sharp cutter in operation at all times assures more continuously uniform work and the holding of required tolerances. The two-bladed Madison cutter will naturally require less maintenance time.



## CONTROLLED FLOAT

Because the Madison cutter is floated in its bar at the exact point where the cutting action takes place, float can be better controlled and indicated for greater uniformity on long-time production jobs. Chances for bell mouth and bar wobbling are eliminated. No special floating tool holders and chucks are necessary.

**MADISON**
MANUFACTURING COMPANY
DEPT. A-6 MUSKEGON, MICHIGAN

Madisons are used for rigid or float reaming on lathes, drills, millers and special machines. Used on hard and soft metals and plastics. Write for the Madison catalog — lists complete lines, prices and grinding instructions.

# First quality tool steels

**High Speed Steels**
Red Cut Superior
E. V. M.
Red Cut Cobalt
Red Cut Cobalt B
Gray Cut Cobalt
Vasco M-2
Van-Lom
8-N-2
Neatro
Vasco Supreme

**Die Steels for Hot Work**
Hotform
Choice
Marvel
Hotpress
Forge-Die
Red Cut Superior
("J" Temper)

**Die Steels for Cold Work**
Non-Shrinkable
Colonial No. 6
Air Hard
Crocar
Ohio Die
Red Star Tungsten
Colonial No. 4

**Carbon and Carbon-Vanadium Tool Steels**
Colonial No. 14
Colonial No. 7
Extra L
Elvandi
Red Star Tool
Red Star Vanadium

**Chrome Vanadium Tool Steels**
Vanadium Types D-G-H-K-N
Vanadium Type BB

**Tool Steels for Special Purposes**
Colhed
Par-Exc
Silman
Mosil
CM
Croman
Nikro M
Speed-Cut

*Manufacturers of*
FIRST QUALITY
TOOL and DIE STEELS
*— exclusively*

# Every one
# • easy-working
# • tough-hardening

because of our

**Controlled Melting Formulas**

Developed through forty-five years of concentration upon the manufacture of First Quality Tool Steels, our Controlled Melting Formulas are unique. They are responsible for the *easy-working, tough-hardening* qualities that are self-evident in the behavior of our Steels . . . they benefit tool design and fabrication . . . they pay off in steel performance on the job. • Visit us and see the reasons—or let us demonstrate, and see the results!

## Vanadium-Alloys
STEEL COMPANY

COLONIAL STEEL DIVISION ANCHOR DRAWN STEEL CO.

LATROBE, PENNA.

# There's no secondary dust problem with a Roto-Clone

**NOT THIS**

**BUT THIS**

**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

### Wet type collection eliminates rehandling and disposal of dry dust

DUST control doesn't end with just the collection of the material. There's the problem of disposal. And that's where Roto-Clone* goes one step farther to do a *complete* job of dust control.

AAF Type W and Type N Roto-Clones are both high efficiency wet type collectors. In both units the collected material is discharged as a slurry or sludge. Method of disposal can be varied to meet your requirements.

Either the Type W or Type N Roto-Clone can be supplied in three arrangements, permitting disposal of sludge by (1) continuous direct discharge to process, settling tanks, disposal tract or sewer, (2) manual removal from storage hopper, or (3) automatic removal from storage hopper by mechanical conveyor.

If you want to control dust completely, both at its source and point of collection, you will want to investigate the Type W and Type N Roto-Clones. Each covers a wide range of applications and both solve the problem of secondary dust control. For complete information, call your local AAF representative or write direct to—

**AMERICAN AIR FILTER CO., INC.**
**207 Central Avenue, Louisville 8, Ky.**
***In Canada: Darling Bros., Ltd., Montreal, P. Q.***

AAF
ROTO-CLONE
DUST CONTROL EQUIPMENT

# ANNOUNCING...

# SQUARE D *Electronic* CONTROL

## FOR HIGH-PRODUCTION SPOT WELDING

**NON-SYNCHRONOUS COMBINATION UNIT** . . . one enclosure houses an electronic contactor to make and break power circuit and a timer to govern weld duration and electrode motion.

**SPEED** • Up to 400 welds per minute. No sequencing relays. Simple six tube circuit cancels out operating delays of valve and firing relays.

**ACCURACY** • Regulated DC timing circuits insure accuracy over wide range of line voltage variations.

**CONSISTENCY** • Timing circuit coordinates firing relay operation to give consistent starting point and full cycles of welding current, thus avoiding high transients and transformer saturation.

**LOW MAINTENANCE** • Industrial construction cuts "down"-time, simplifies servicing. Disconnect plugs permit instant exchange of timer panels. Entire timer, including power supply, is removed in one piece without disturbing external connections. Two ¼ turn fasteners release swing-down panel making all components and circuit tie points instantly accessible at screw terminals.

### The BEST Resistance Welder Control?

● **There is no one type. Square D builds both magnetic and electronic controls of many types—each best suited to certain types of applications. Specify Square D, and be sure of getting the best for your job.**

*HIGH SPEED* CONTACTORS

MOTOR DRIVEN TIMERS

*Safeaut* TIMERS

*Electronic* TIMERS & CONTACTORS

*SYNCRO-BREAK* CONTACTORS

SYNCHRONOUS-PRECISION COMBINATION CONTROLLERS

Class 8992, Type ACG-1 for wall mounting

Class 8992, Type ACG-2 for side of machine mounting

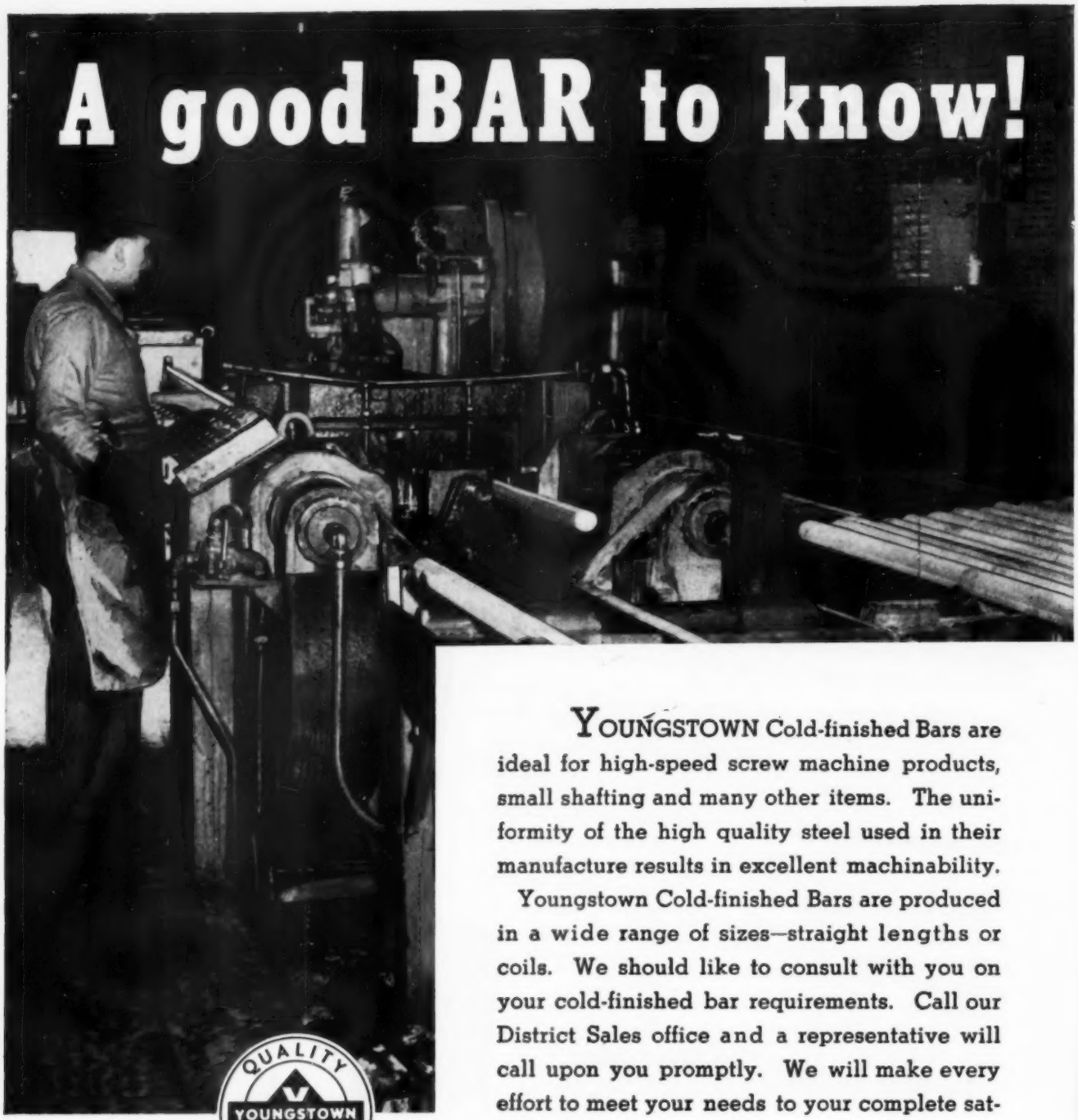
***Write*** **for Bulletin 214, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin**

## SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

# A good BAR to know!



YOUNGSTOWN Cold-finished Bars are ideal for high-speed screw machine products, small shafting and many other items. The uniformity of the high quality steel used in their manufacture results in excellent machinability.

Youngstown Cold-finished Bars are produced in a wide range of sizes—straight lengths or coils. We should like to consult with you on your cold-finished bar requirements. Call our District Sales office and a representative will call upon you promptly. We will make every effort to meet your needs to your complete satisfaction.

QUALITY · YOUNGSTOWN · SERVICE

## Youngstown

**COLD FINISHED CARBON AND ALLOY STEEL BARS**

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

*Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

CONDUIT · PIPE AND TUBULAR PRODUCTS · BARS · RODS · COLD FINISHED CARBON AND ALLOY BARS · SHEETS · PLATES · WIRE · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · TIE PLATES AND SPIKES.

# Thor ANNOUNCES THE ½" Silver Line DRILL

**Much Smaller**

**Much Lighter**

**Far More POWERFUL!**

## The World's Most Advanced ½" ELECTRIC DRILL

INDEPENDENT PNEUMATIC TOOL COMPANY

Aurora, Illinois

Export Division: 330 West 42nd St., New York 18, N. Y.

Birmingham · Boston · Buffalo · Chicago · Cincinnati · Cleveland · Denver · Detroit · Houston
Los Angeles · Milwaukee · New York · Philadelphia · Pittsburgh · St. Louis · St. Paul
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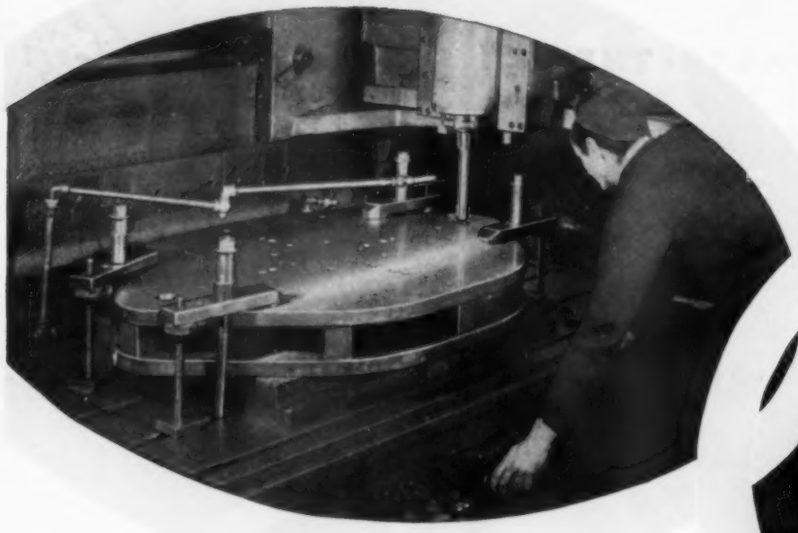
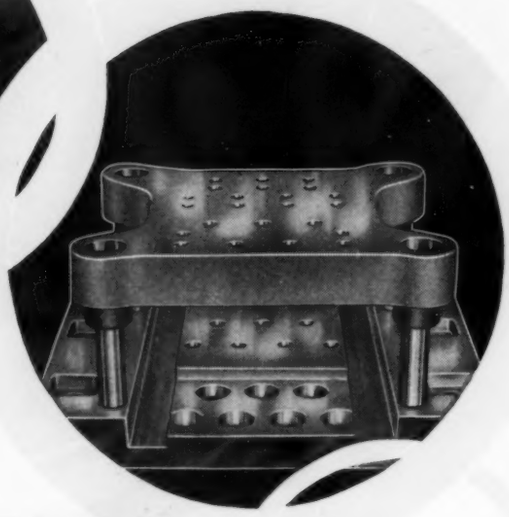
Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS





## A TIE UP TO SPEED UP

*"Near Neighbor" Service*

# PRODUCTO

## DIE SETS

The three links that tie together the factors you need to obtain Special Die Sets are Plant, Product and Service.

So let's look at the Producto record.

From foundry to finish your "Special" moves smoothly thru a cycle, every step of which employs expert manpower working with the finest of modern machines . . . many of them Producto-designed.

The product itself is the highest development of precise skills . . . both in design and finish . . . proven for many years under critical and demanding conditions.

But the Plus feature . . . Producto "Near Neighbor Service" is unexcelled in its field. It is your assurance of correct interpretation of your needs and fast delivery.

We prove these facts when you "specify Producto."

*"Near Neighbor"*
**SERVICE**

**ATLANTA** Main 4451
**BALTIMORE** Plaza 0340
**BIRMINGHAM** 54-9521
**BUFFALO** Cleveland 1110
**CAMDEN, N. J.** 4-7765
**CHICAGO** Central 6680
**CLEVELAND** Superior 6159
**DAYTON** Madison 5361
**DETROIT** Walnut 1-3101
**ELMIRA** 5168
**ERIE** 5-4375
**GREENSBORO, N. C.** 2-0608
**INDIANAPOLIS** Franklin 3508
**LOS ANGELES** Trinity 9826
**MIAMI** 3-2384
**MONTREAL** MA 5346
**NEW YORK** Worth 4-7484
**PHILADELPHIA** Lombard 3-1256
**PITTSBURGH** Atlantic 4116
**ROCHESTER** Main 5249
**ST. LOUIS** Jefferson 4805
**SAN FRANCISCO** Exbrook 2-2230
**SYRACUSE** 3-1181
**TORONTO** Hudson 9071
**YORK, PA.** 2042

**THE PRODUCTO MACHINE COMPANY** 990 HOUSATONIC AVE. BRIDGEPORT 1, CONN. TEL. 4-9481

*Phone for "Near Neighbor" Service*

13PD48

# Irons out trouble on a heavy steel job...

## Stanicut 309 BCS

***The material:*** **S.A.E. 1010 steel, 9 gauge**

***The job*** **(see photographs):**

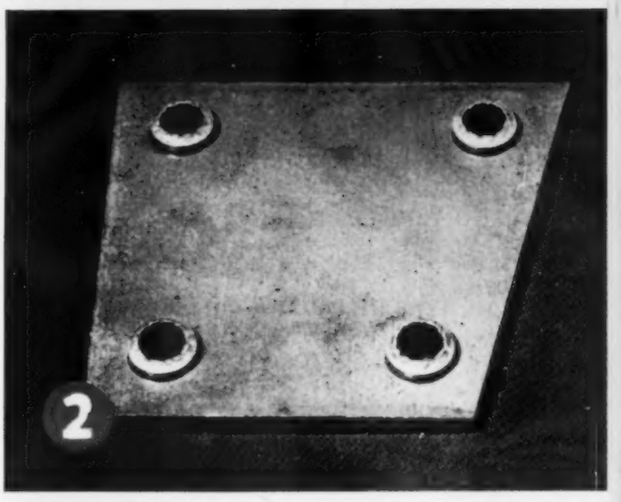
1. Drawing and punching angle template, in one operation, produces
2. a blank with four flanged holes.
3. A tapping operation completes
4. the finished plate.

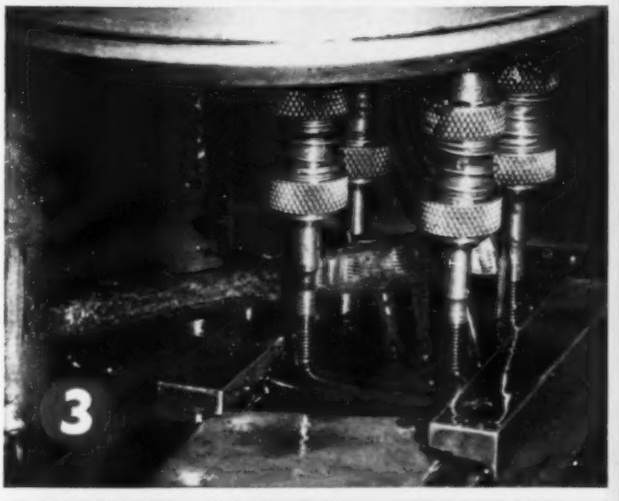
When first set up, this job caused no end of trouble for a midwest metalworking plant. Holes could not be held to proper size because of excessive loading on the punches and the drawing dies. On the tapping operation, threads were stripped or torn and taps had to be changed frequently.

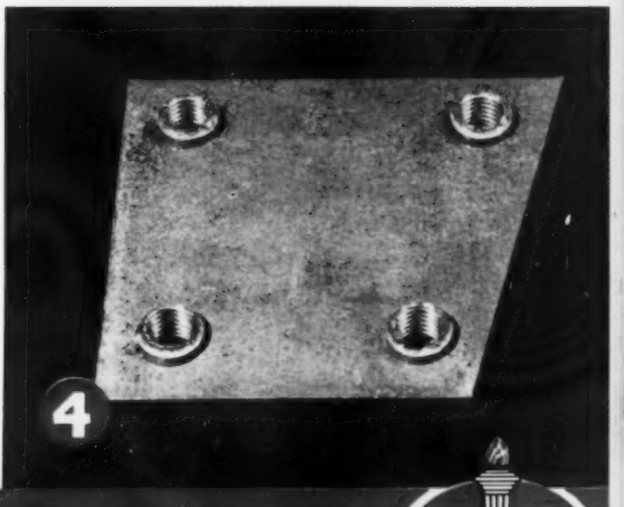
Various oils and compounds were tried on this job. None produced the desired improvement until a Standard Cutting Oil Engineer was asked for a recommendation. He analyzed the operation and decided that an oil of high sulfur and chlorine content was needed. He suggested Stanicut Oil 309 BCS.

With this oil a highly satisfactory production rate was obtained. Loading of the punches and the forming die stopped completely. Holes were held to uniform sizes. Believe it or not, as many as 6,000 plates have been produced before taps were changed.

If you are having trouble with a new machining or stamping operation, call in a Standard Cutting Oil Engineer. He can help you select a cutting oil that will give the best possible tool and production performance. If your plant is located in the Middle West, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the engineer nearest you.

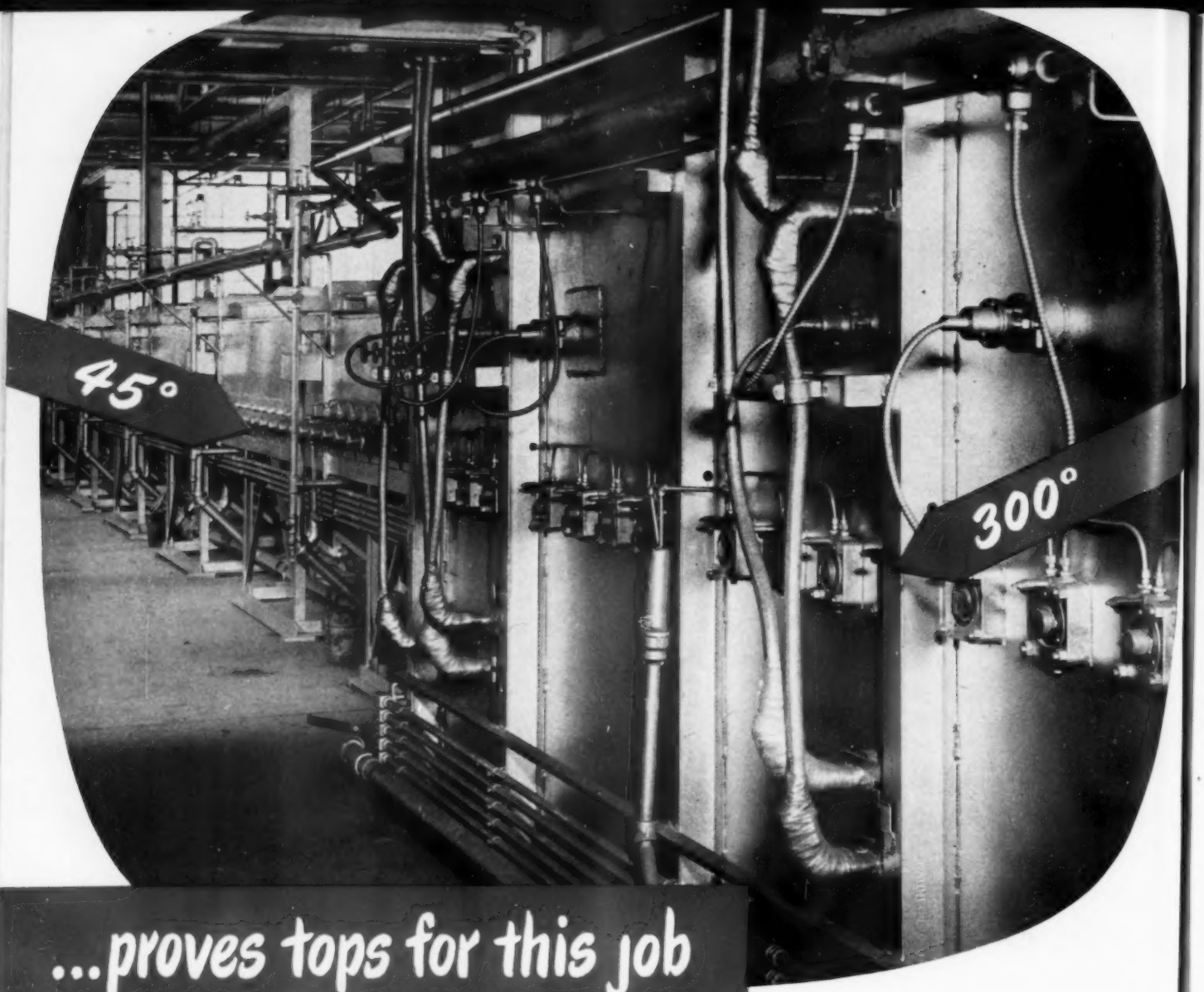



STANDARD OIL COMPANY (INDIANA)

STANDARD




# ...proves tops for this job

A sizzling 300°F. to a chilly 45°F.—that's the temperature range of the various conveyor bearings on the brazing oven and cooler illustrated above. Yet Stanobar Grease is used on all 350 bearings in the unit.

This grease has a high melting point, so that on the hot bearings it resists thinning out and does not separate. At the same time Stanobar maintains a smooth, workable consistency on the cool bearings. As a result, all bearings are protected against wear, dirt and moisture at all times.

Stanobar Grease can reduce lubricating cost on the many anti-friction bearings in motors and machines in your plant. Two grades are available, for application either by grease gun or through central lubricating systems. Ask for the services of the Standard Oil Lubrication Engineer in your midwest locality. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**STANOBAR GREASE**

**STANDARD OIL COMPANY (INDIANA)**

STANDARD

# THEY MAY LOOK ALIKE . . . *but there's a difference!*

Both gowns look alike to the camera's eye, but one is an original creation . . . the other a clever copy. By actual comparison a vast difference in quality and value is evident to the expert.

## THERE IS A DIFFERENCE IN TAPS, TOO!

They may look alike at first glance, but the careful workmanship in BATH ground thread taps is easily detected by the experienced craftsman. Vital manufacturing intangibles too — such as quality control and pride in the product — consistently maintain this high Bath standard. Right from the start BATH stock and special taps are planned for uniformity and accuracy — they're ground from the solid AFTER hardening.

In your plant, this means greater speed, more holes per tap, longer runs between sharpenings, improved accuracy and cleaner threads — assuring holes consistently within gaging limits.

You'll find BATH commercial and precision taps for any regular job and experienced BATH engineers to help you with unusual threading problems. Insist on BATH taps. Profit by their plus-performance!

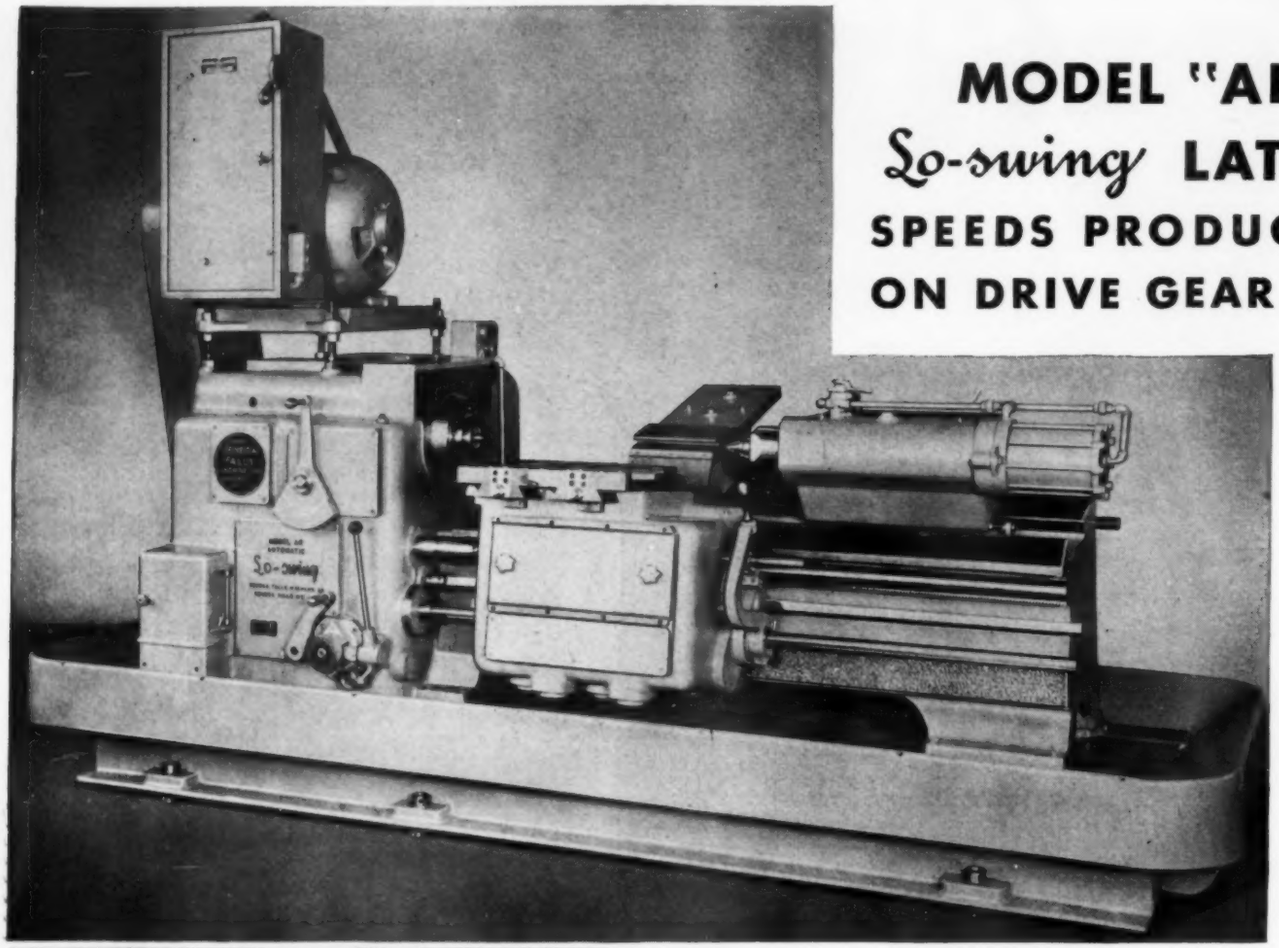
PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

**JOHN BATH CO. INCORPORATED**

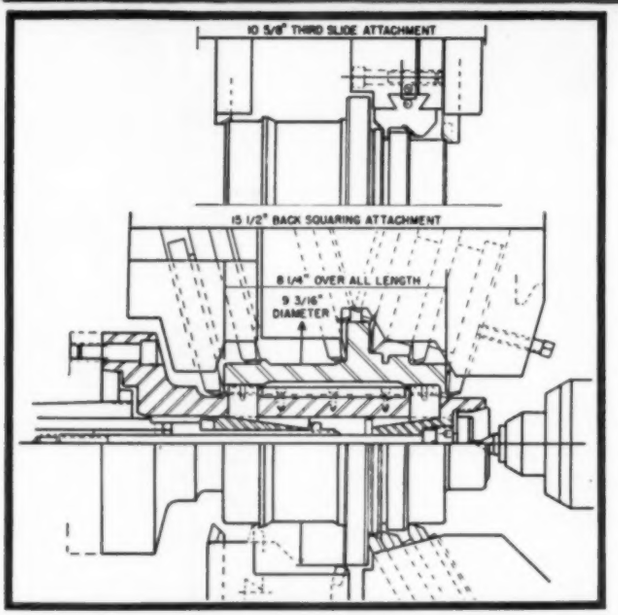
**22 Grafton St., Worcester, Mass.**

# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YOR



## MODEL "AR" *Lo-swing* LATHE SPEEDS PRODUCTIO ON DRIVE GEAR HUB




***Problem:*** To automatically turn, face and chamfer shoulders and cut groove on Gear Hub with 9" Flange diameter, locating and centering from bottom of spline previously machined.

***Solution:*** The Model "AR" Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools.

The expanding, air-operated driver, shown in the line drawing and the main illustration, is fitted with two sets of six driving jaws which accurately center the part true with the bottom of the splines. The jaws are actuated with two independently-expanding bushings and pull bars which equalize the pressure on both sets of jaws. The parts are located longitudinally on the arbor by an automatic, air-operated locator, which moves forward to the exact locating position when the tailstock spindle is withdrawn and relieves when the spindle is advanced.

All diameters are turned with the tooling mounted on the front carriage slide. The squaring, chamfering and grooving operations are divided between the rear and vertical slides in order to simplify the tooling which is used for several different sizes of hubs. The line drawing shows the tooling in detail.

Consult our Engineering Department for Automatic Lo-swing Lathes engineered for your particular turning problems.

**SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.**

**PRODUCTION COSTS ARE LOWER WITH *Lo-swing***

# CENTURY MOTORS'

## Complete Line Aids Proper Application — Helps Keep Production Moving

The line of Century Motors is so complete that you can select the *right* motor for all popular applications.

Your motor driven machines may require high, low or normal torque; single speed, multispeed or variable speed; a.c. or d.c. current; open, splash proof, enclosed or explosion proof construction. Most of the popular combinations of these electrical characteristics and frame designs are built by Century.

Many maintenance men say that improper motor selection is too often the cause of production failures. You can reduce these expensive shutdowns by selecting the right Century Motor.

Century builds a complete line of fractional and integral horsepower electric motors and generators in the popular sizes to meet the requirements of industrial production, commercial and appliance needs.

Specify Century for all your electric power needs.

Century C MOTORS

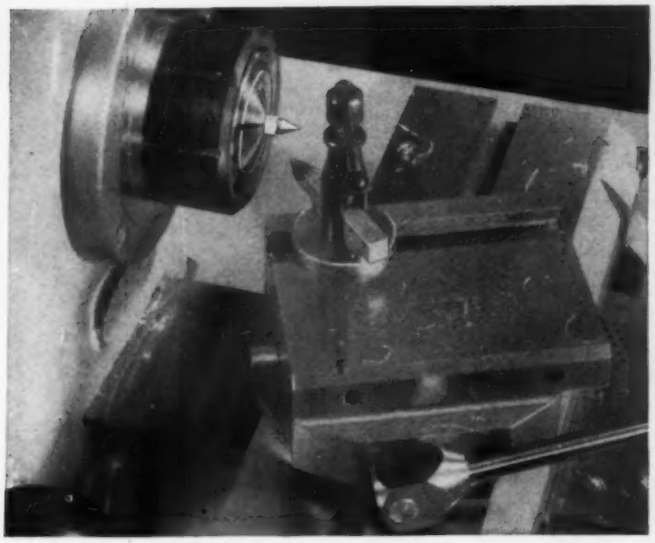
**CENTURY ELECTRIC COMPANY** • 1806 Pine Street, St. Louis 3, Missouri

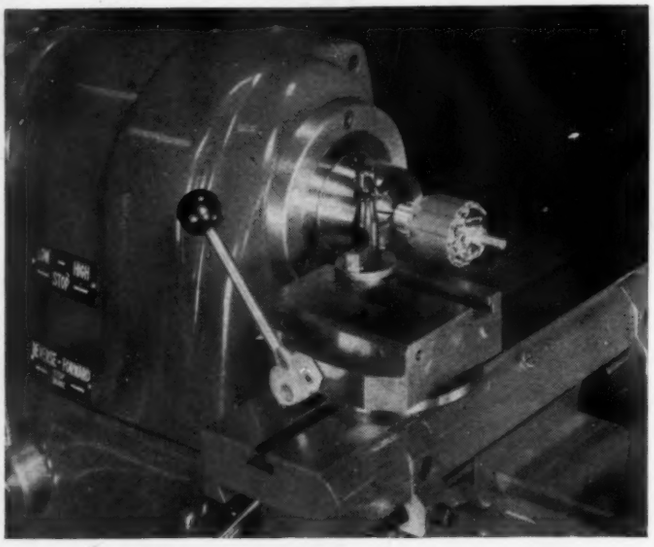
*Offices and Stock Points in Principal Cities*

340

HARDINGE
ELMIRA, N.Y.

# High Speed Production Turning of Precision Automotive Parts





## TURNING NEEDLE VALVES

Modern carburetors require needle valves made to laboratory accuracy. Valves turned on Hardinge machines set new and high standards of accuracy and, at the same time, reduce costs by a direct increase in production.

## TURNING COMMUTATORS

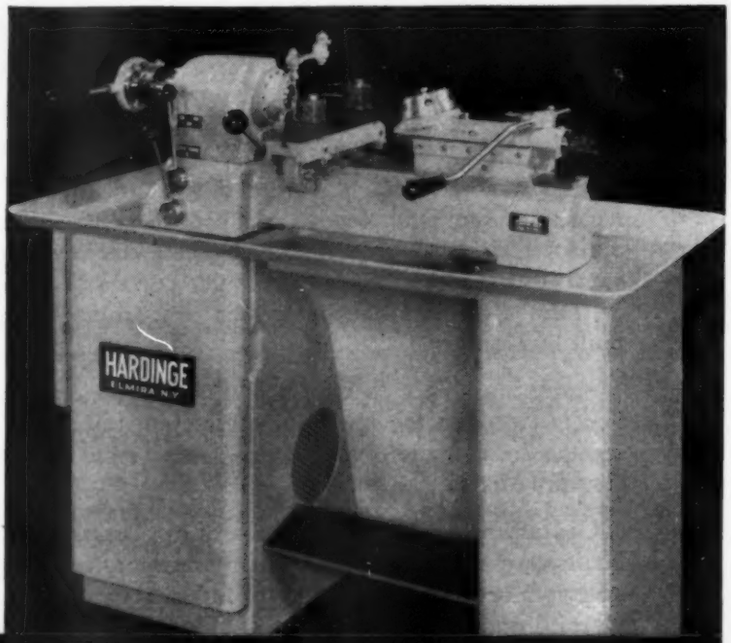
High spindle speed, rigidity and built-in accuracy make commutator turning on Hardinge equipment an easy production job. Smooth finish, concentricity and no "drag over" of copper assure a carefree production schedule.

## HARDINGE
## High Speed Precision Second Operation Machine

1" collet, 6" step chuck, 5" jaw chuck capacity; eight spindle speeds to 4000 r.p.m.; preloaded ball bearing construction for spindle and turret; hardened and precision ground steel ways; turret and cross slide operating levers are adjustable to suit the operator.

Save time and money through the use of Hardinge Precision Second Operation Machines in your plant.

Write for descriptive bulletin DSM59.

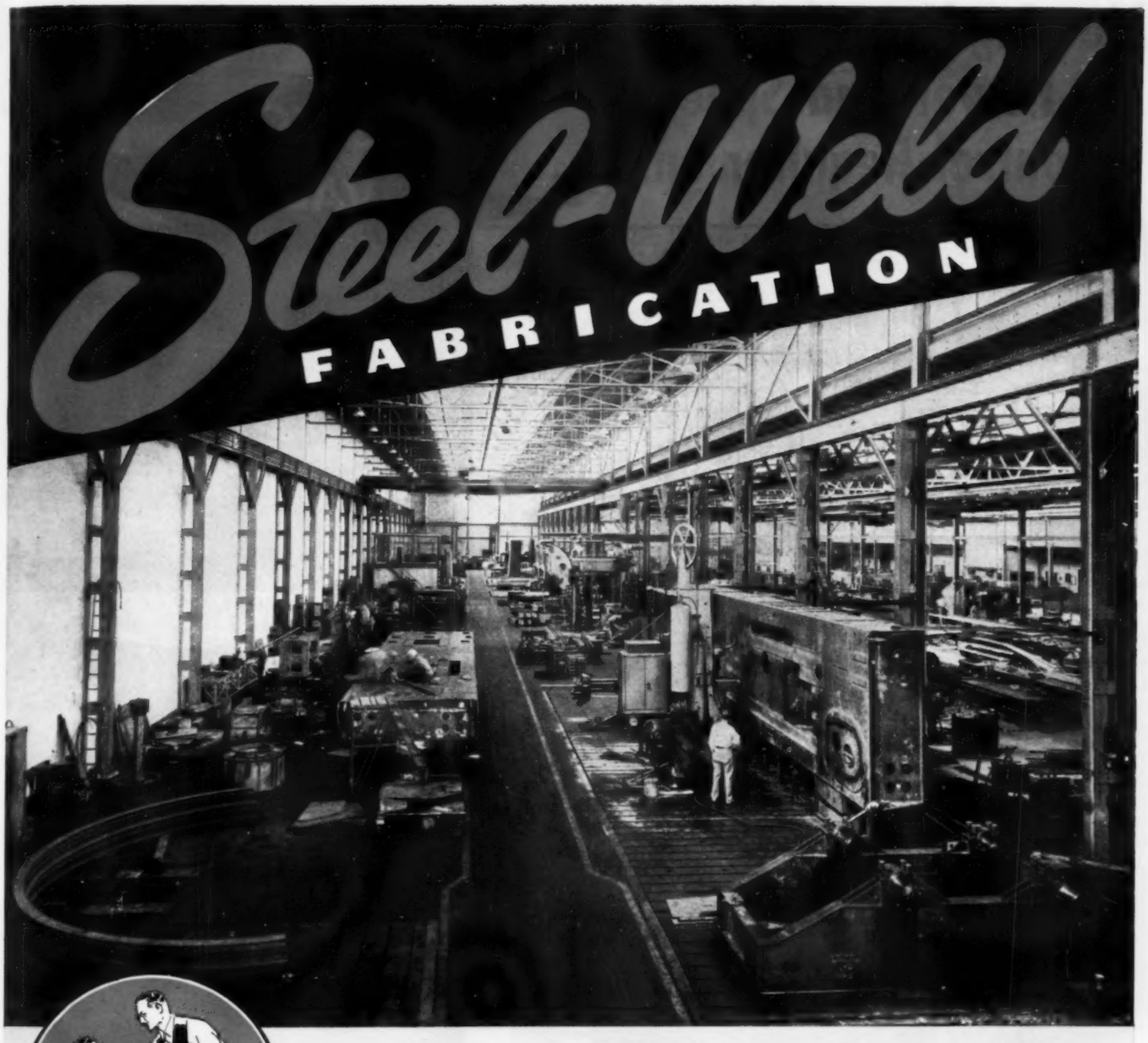



**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Offices in principal cities. Export office, 269 Lafayette St., New York 12, N. Y.

# Steel-Weld FABRICATION



## *Unusual* Machining Facilities

**Here you see a general view of the Mahon Machine Shop. This completely equipped shop is capable of handling any machining operation in connection with Steel-Weld Fabricated parts or products—particularly those heavy, cumbersome jobs which require unusual facilities. You will find in the Mahon organization an excellent source for tailor-made weldments of any kind regardless of size or weight—a source with complete modern facilities for producing and machining. A staff of design engineering experts backed up by highly skilled craftsmen is your assurance of a better, smoother appearing job, embodying every advantage of Steel-Weld Fabrication.**

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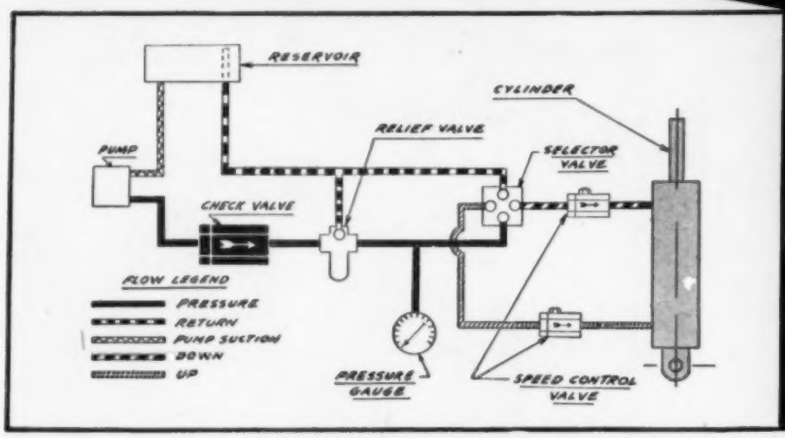
*Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products*

# MAHON

# Meeting Your Hydraulic or Pneumatic Power and Speed Control Requirements

## CHECK VALVES



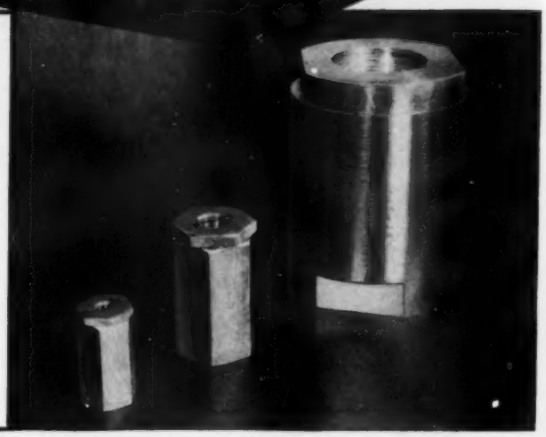



Illustration shows use of Electrol Check Valve in system to prevent loss of pressure through pump when unit is shut off.

ELECTROL CHECK VALVES provide positive sealing from low to high pressures. 5,000 p.s.i. maximum. Standard models feature bronze and brass elements. Special models, steel or other metals best suited to the service required. These valves provide air, gas, water and oil control lines with a minimum of pressure drop and positive sealing against return flow. They are successfully used in the hydraulic or pneumatic systems on busses, trucks, railroads, boats, aircraft, farm and road building equipment, and in a wide variety of industrial installations.

## SPEED CONTROL VALVES

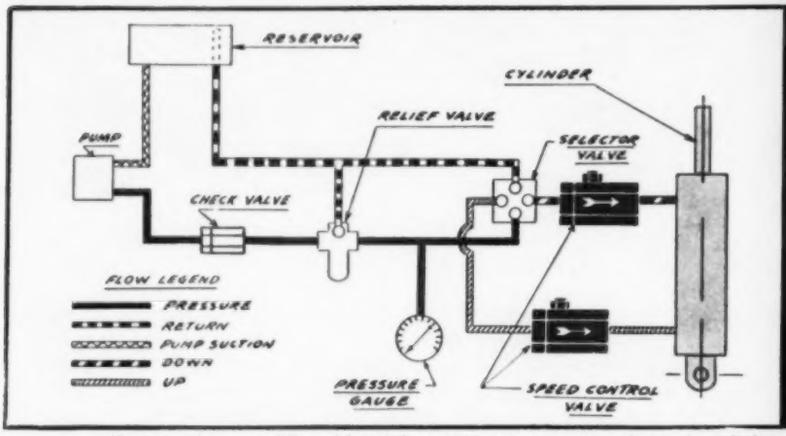


Illustration shows use of Electrol Speed Control Valves in conjunction with actuating cylinder to control speed of piston rod motion in both directions.

ELECTROL SPEED CONTROL VALVES allow flow in one direction and—by use of a metering device—provide controlled flow in the opposite direction. Flow is controlled by a screw-actuated metering pin in the side of the valve. With pressures up to 1,500 p.s.i. and more, this valve handles air and oil—with equal facility—at high or low pressures. Standard sizes ⅛, ¼, ⅜, ½ and ¾-inch NPT ports. Special sizes to order.

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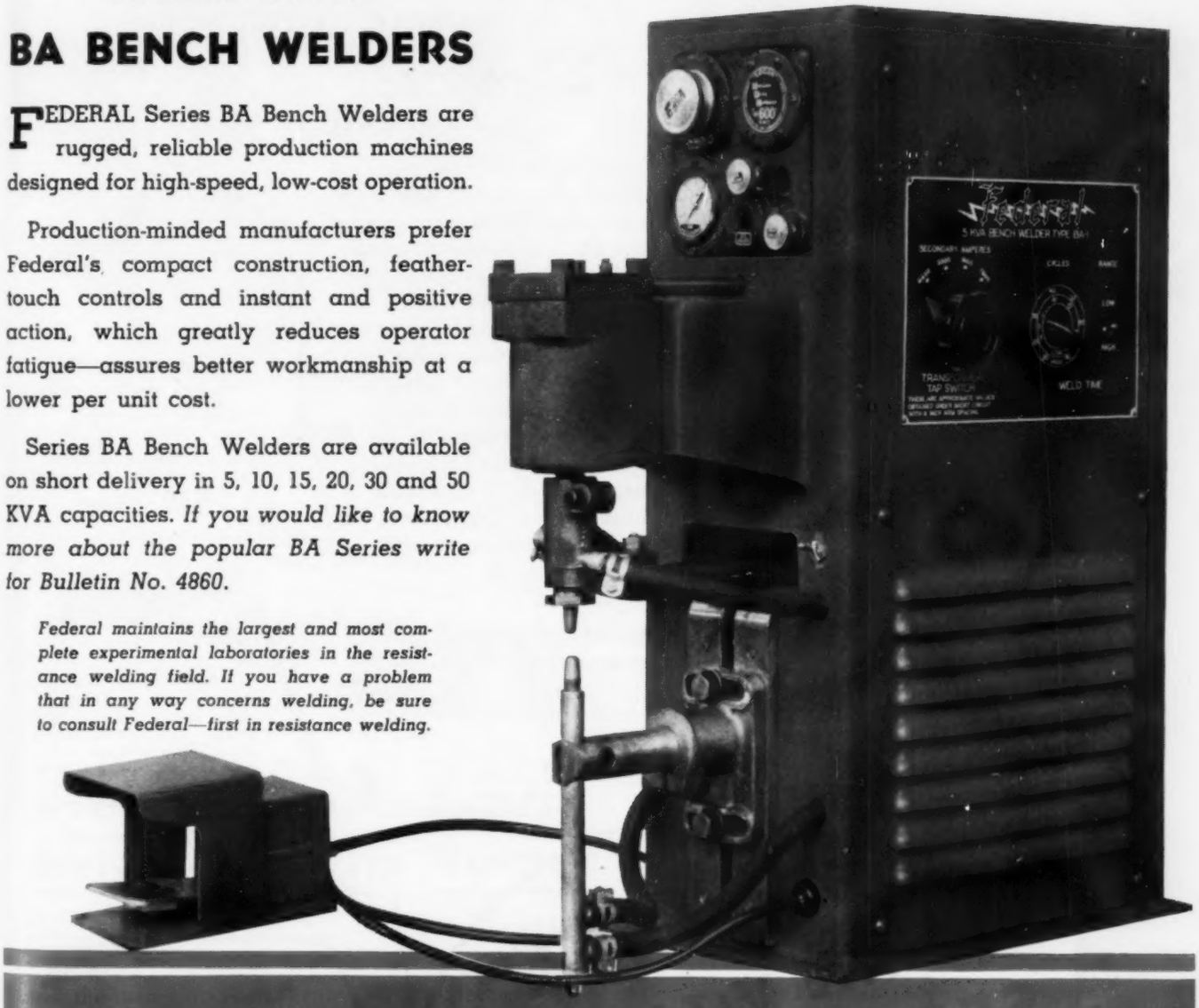


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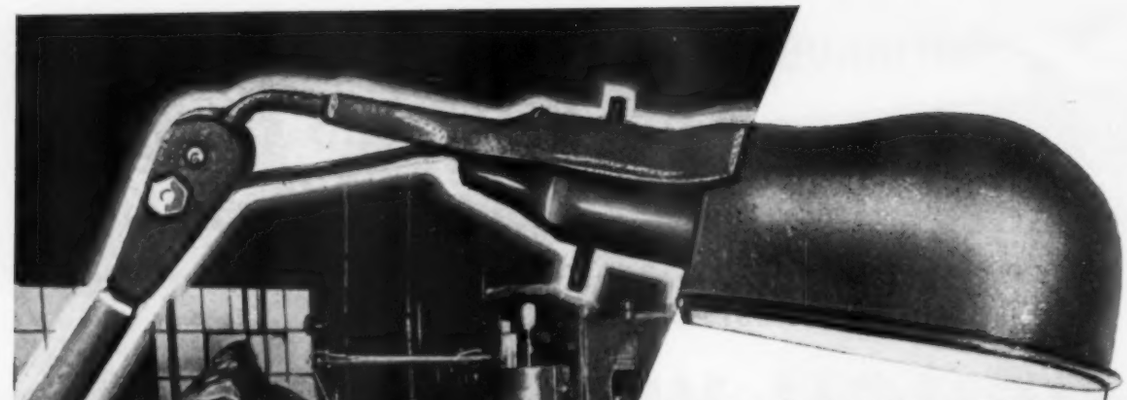

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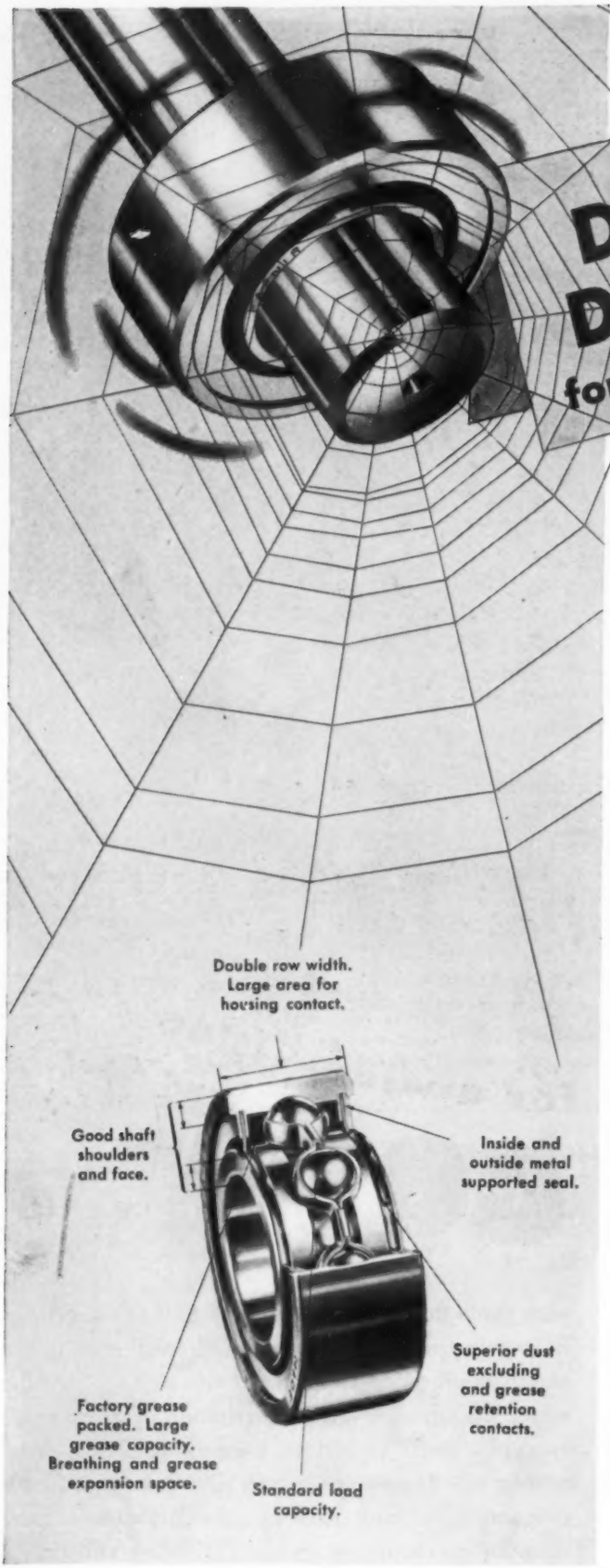
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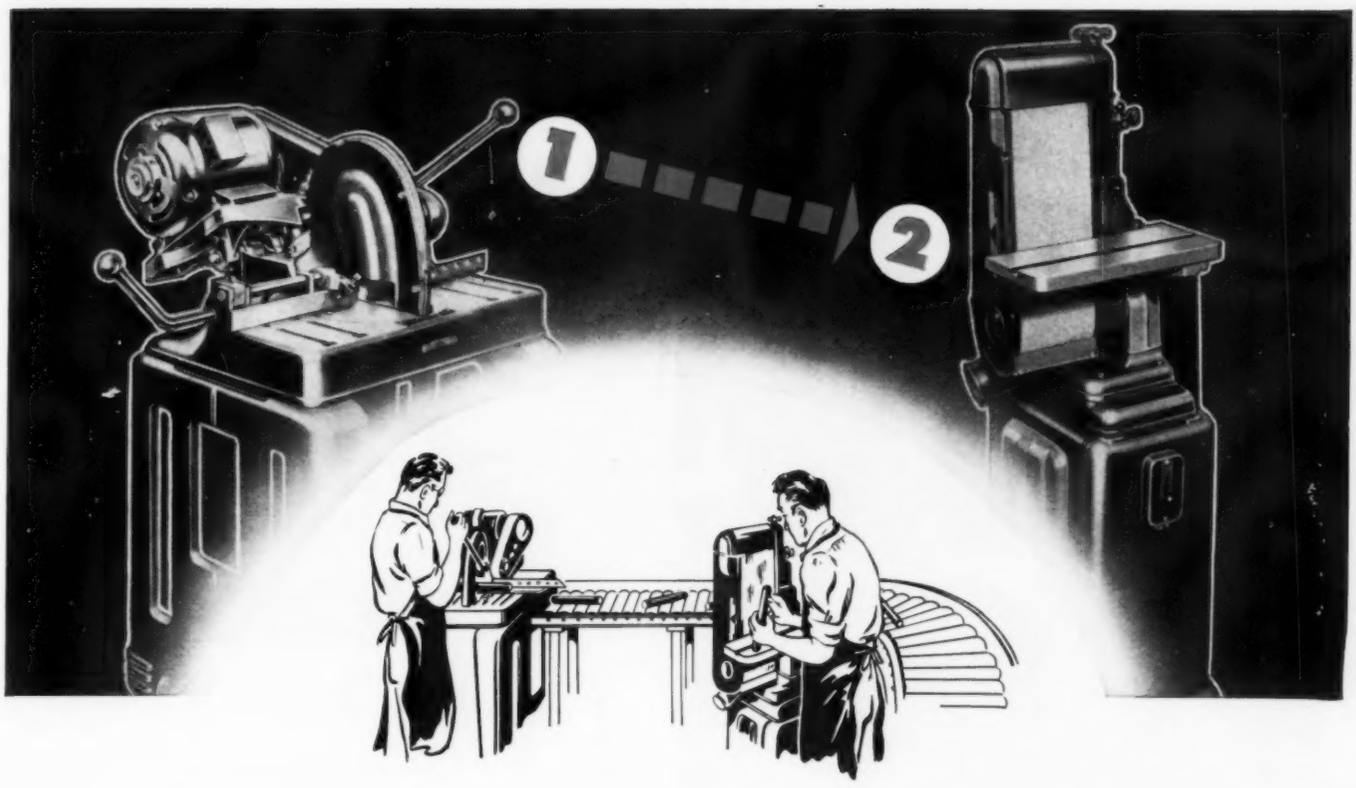


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M-33

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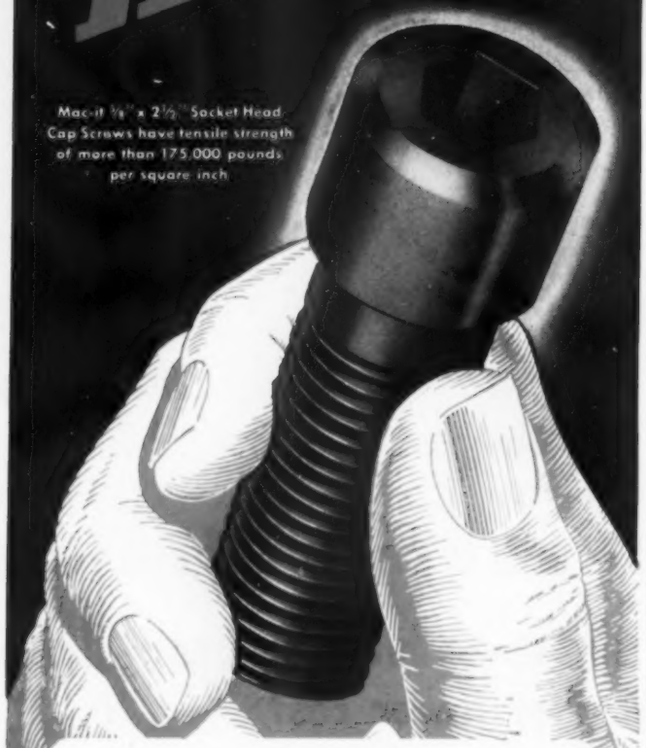


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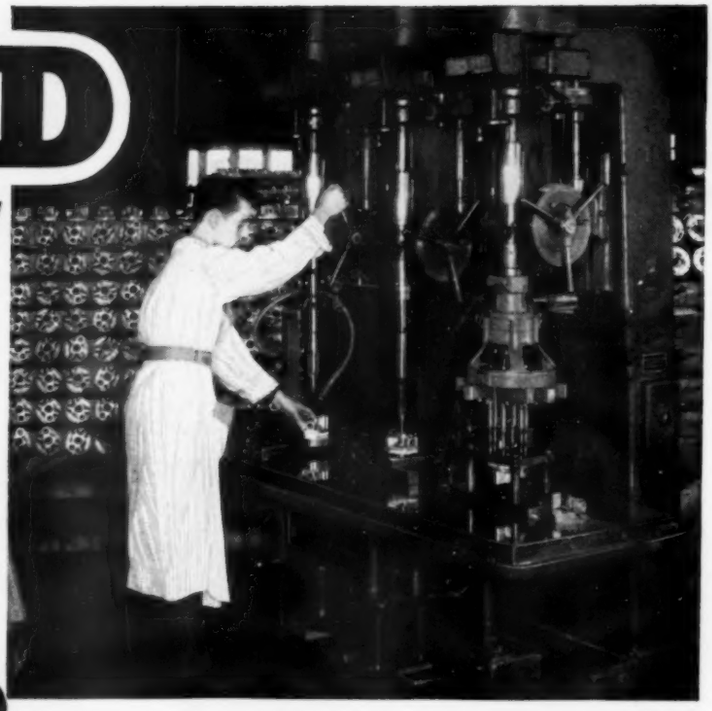

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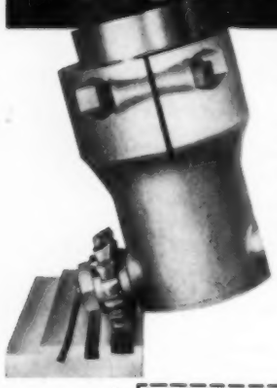

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P-13 Ratiobar 3-dimensional Pantograph

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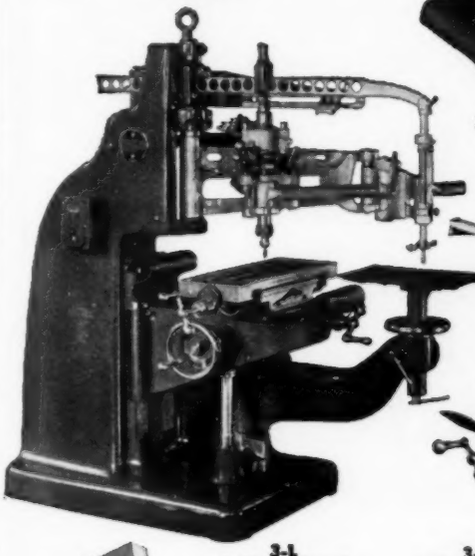

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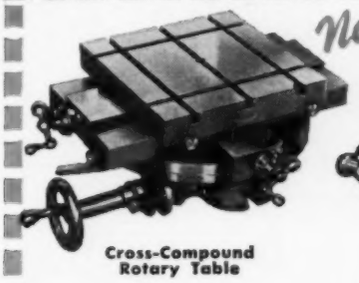
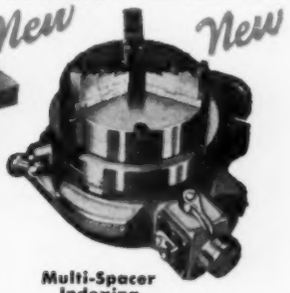



Cross-Compound Rotary Table

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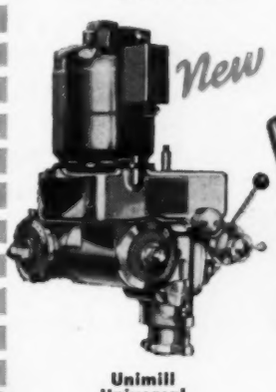


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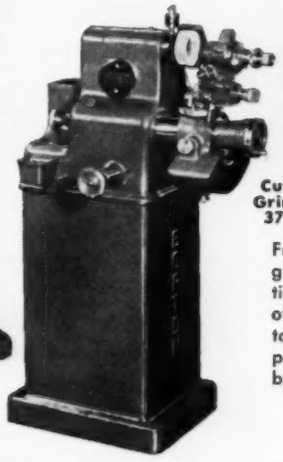

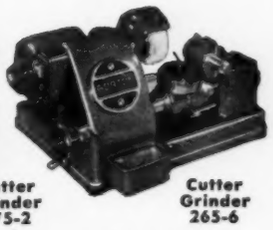

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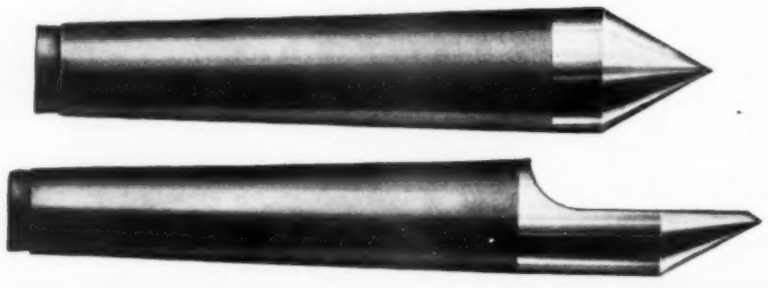

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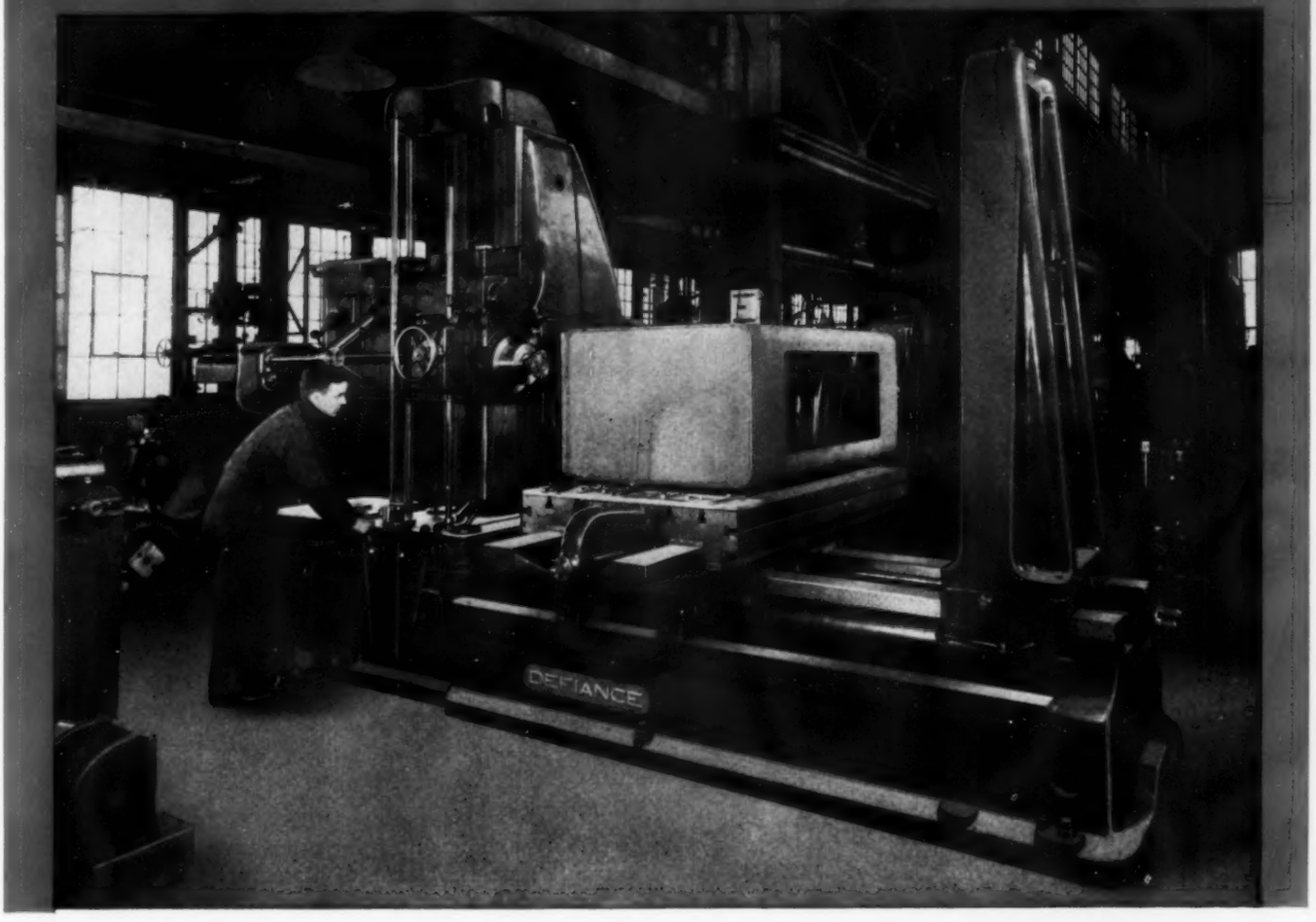


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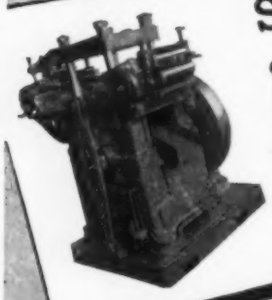
**COMPLETE-PER-STROKE**

*on HEW Dieing Machines*



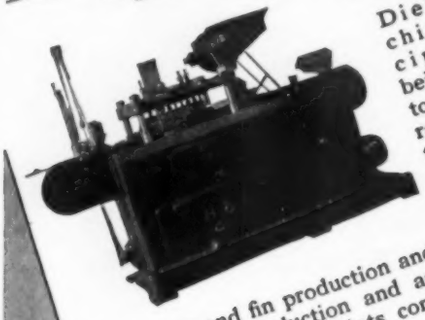
**STANDARD**

Capacities: 10 tons to 300 tons. Combining blanking, piercing, forming, drawing, coining, extruding, broaching, etc., in pieces produced complete-per-stroke at speeds up to 600 s. p. m.

**SPEEDMASTER**

This new machine substantially exceeds previous standards for high production combined with high die life. Controls 100% centralized, with variable speed drive permitting optimum operation at all times. Capacities: 25 and 50 tons.

**SPECIAL**



Dieing Machine principles are being adapted to an endless range of operations such as primer inserting, bullet assembly, radiator tube and fin production and assembly, rotor lamination production and assembly on rotor shaft, folding rule joints complete production, etc., etc.

REQUEST CATALOG 48

**THE HENRY & WRIGHT MFG. CO.**

484 Windsor Street Hartford 1, Conn.

**HENRY & WRIGHT DIEING MACHINES**

**THE GLOVE THAT KEEPS COMING BACK FOR MORE**

**JOMACS OUTWEAR ORDINARY WORK GLOVES BY AS MUCH AS *700%*... SHOP RECORDS PROVE IT!**

As much as *700% more wear* than from ordinary work gloves—that's what you get when you use JOMAC Gloves. Proved in shops where long glove-service is a must, JOMAC Gloves will give you outstanding glove-economy, plus performance that can't be touched by ordinary work gloves.

JOMAC Gloves can be washed or dry cleaned repeatedly, and used again and again. They have unusual flexibility, which permits complete hand-freedom and assures a quick, firm grip every time. These remarkable gloves are made from the original Jomac fabric, a tough, loop-finished cloth with hundreds of "air-cell" cushions held securely in place by hidden lock-stitches.

Try JOMAC Gloves in your shop. Keep a record of their performance. You'll need no better proof of our statement that JOMAC Gloves give up to 700% more wear than ordinary gloves. For full details, write C. WALKER JONES Co., 6139 North Lambert St., Philadelphia 38, Pa. Plants in Philadelphia, Pa., Detroit, Mich., and Warsaw, Ind.

*Foreign Representatives:* Gillespie & Co. of New York, Inc., 96 Wall St., New York 5, N. Y.

*"SHAKE HANDS WITH SAFETY"*

**JOMAC INDUSTRIAL GLOVES**

**THREE TYPES OF JOMAC GLOVES**

REGULAR INDUSTRIAL TYPE • HEAT- AND FLAME-RESISTING

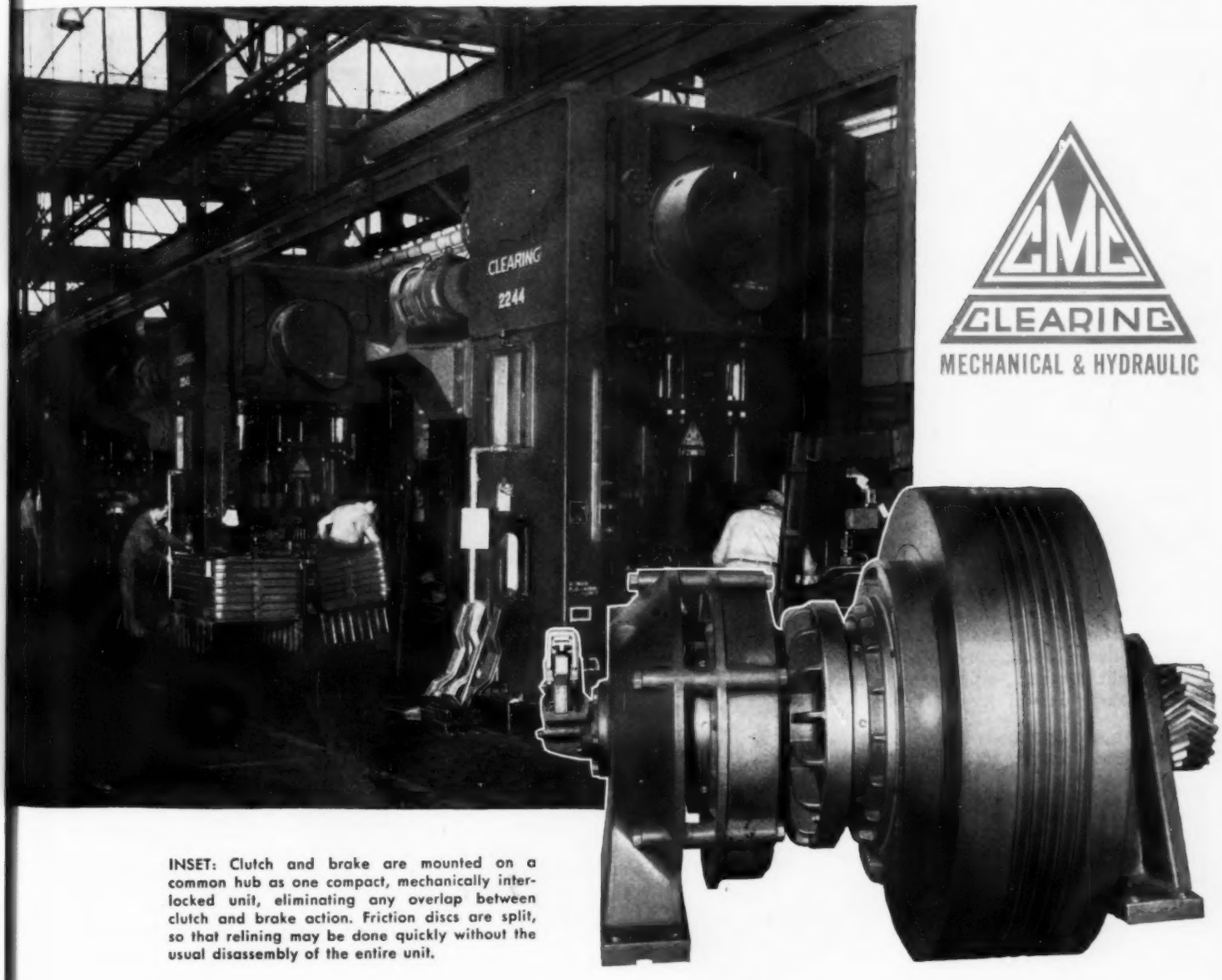
SAFETY GAUNTLET-CUFFS

# MAKING THE MOST OF A BETTER METHOD

You can usually save a lot of money by producing parts on a press rather than by other means—but don't let that saving blind you to the possibility of further economy after you've chosen press methods.

When you put your job on the proper Clearing press, you will be making the most of a better method. Your dies will last longer, require less regrinding. Your production will be speeded by fewer interruptions for servicing either dies or press. And when such service is needed, it will consume less precious time because Clearing engineers know the cost of down-time and have planned to hold it to a minimum.

These are cold, hard facts, and we have convincing proof which we would like to show you. It costs you nothing to consult us about ways to more economical production with Clearing presses.




CMC
CLEARING
MECHANICAL & HYDRAULIC

INSET: Clutch and brake are mounted on a common hub as one compact, mechanically interlocked unit, eliminating any overlap between clutch and brake action. Friction discs are split, so that relining may be done quickly without the usual disassembly of the entire unit.

**CLEARING MACHINE CORPORATION • 6499 W. 65th St., Chicago 38, Ill.**

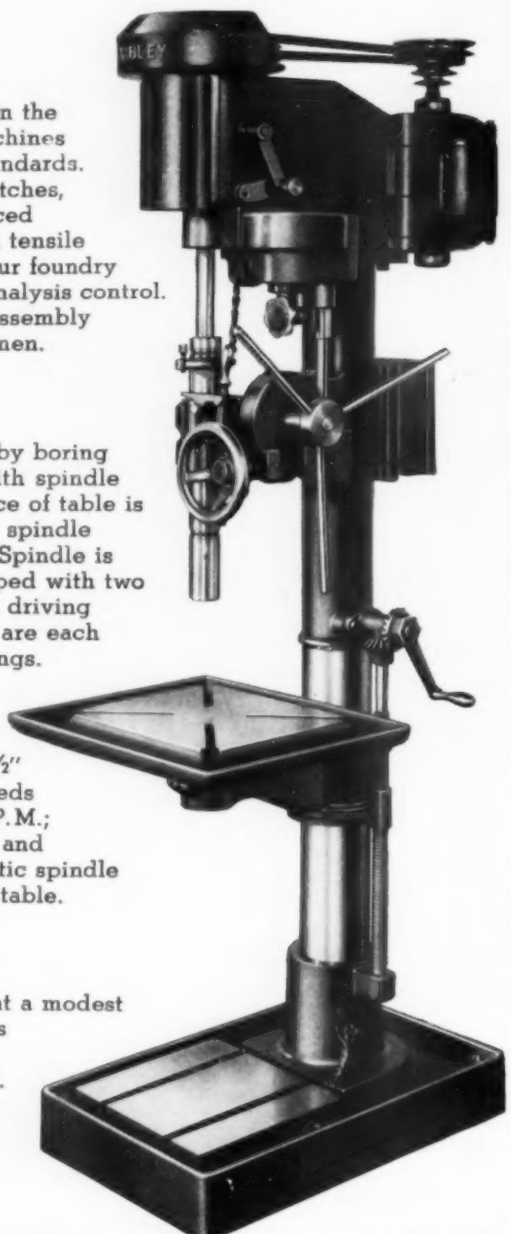
**CLEARING** THE WAY TO EFFICIENT MASS PRODUCTION

CMC CLEARING

# SIBLEY

MODEL C-20

## DRILLING MACHINE



**QUALITY**

Over 70 years experience in the manufacture of drilling machines provides highest quality standards. All parts except motors, switches, V-belts and bearings produced within our own plants. High tensile strength castings made in our foundry under constant laboratory analysis control. Machining operations and assembly performed by master craftsmen.

**ACCURACY**

Table alignment is assured by boring table arm after assembly with spindle furnished on machine. Surface of table is maintained at right angle to spindle within .0007" in six inches. Spindle is precision ground and equipped with two ball thrust bearings. Spindle driving sheave and large back gear are each supported by two ball bearings.

**FEATURES**

20" swing; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M.; geared power feeds; simple and convenient controls; automatic spindle stop; rectangular oil groove table.

**PRICE**

Extraordinary performance at a modest cost. Model C-20 machine as illustrated complete with 2 H.P., 3 phase, 60 cycle, A.C. motor and magnetic type starting switch . . . $849.75, F.O.B. South Bend, Indiana.

SIBLEY

MACHINE & FOUNDRY CORP.
18 EAST TUTT STREET
SOUTH BEND 23, INDIANA

**SIBLEY MACHINE & FOUNDRY CORP.**
**18 E. Tutt St., South Bend 23, Indiana**
Send Catalog No. 67, Free!

Name ..... Title .....
Company .....
Address .....
City ..... State .....

# GOVERNMENT SPECIFICATION RUST PREVENTIVES

## from 1 SOURCE

## NOX-RUST

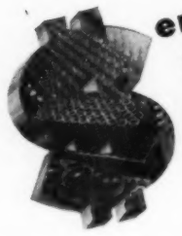
gives you the exact rust preventive coating specified by ECA or any U. S. Government Bureau for metal parts, tools and machines to be shipped abroad . . . simplifies correspondence and ordering . . . reduces stocking . . . gives you complete assurance that all requirements have been met.

These NOX-RUST products were developed to meet all government specifications for use on materiel shipped during the war, and for the storage of ships, machines and other equipment during the postwar period . . . and **today** NOX-RUST continues its wartime policy of supplying government and industry with the best rust preventives it is possible to secure.

Rigid control of raw materials and manufacturing processes established to meet these specifications has been continued at NOX-RUST.

Extensive research under exacting laboratory tests continues to be the rule. Every development in materials and processing is incorporated in NOX-RUST products as soon as it has proved its value.

NOX-RUST preventives are proved in actual use through exposure to all weathers and temperatures, all degrees of humidity, and to corrosive vapors and atmospheres.



**send today for the handy NOX-RUST reference chart**

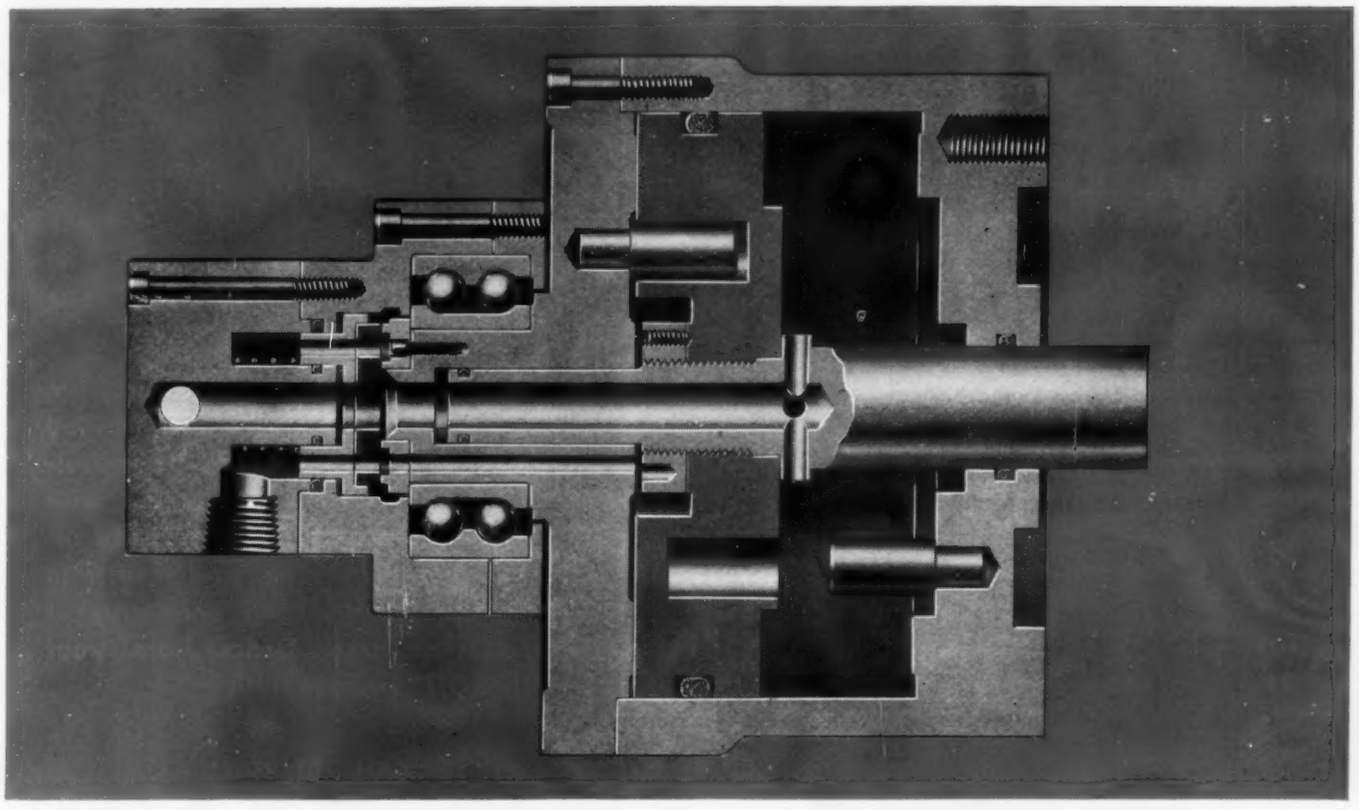
**NOX-RUST CHEMICAL CORPORATION**
**2439 South Halsted Street, Chicago 8, Illinois**

**NOX-RUST CHEMICAL CORPORATION**
**2439 So. Halsted St., Chicago 8.**

Without obligating us in any way, please send your handy Rust Preventive Use Chart listing government approved products.

Name.....
Address.....
Attention of.....
Title.....

# NEW CUSHMAN HIGH SPEED AIR CYLINDERS



New positive pressure-balanced air seal and lock that reduces air leakage to a minimum.

Precision forged aluminum alloy construction with lapped bores. Light weight . . . low flywheel effect . . . long troublefree service.

Large air ports and low inertia result in much faster action . . . savings in time on short run operations.

Entire cylinder statically balanced *after* assembly for smooth operation at speeds up to 3500 r.p.m.

*3¼" to 18" sizes. Write for further information.*

*a feature of* **CUSHMAN POWER CHUCKING EQUIPMENT**

CUSHMAN also manufactures a complete series of WRENCH OPERATED CHUCKS
Write for Catalog 63 and Bulletins

Send for Catalog PO-63 for information on Air Operated Power Chucks.

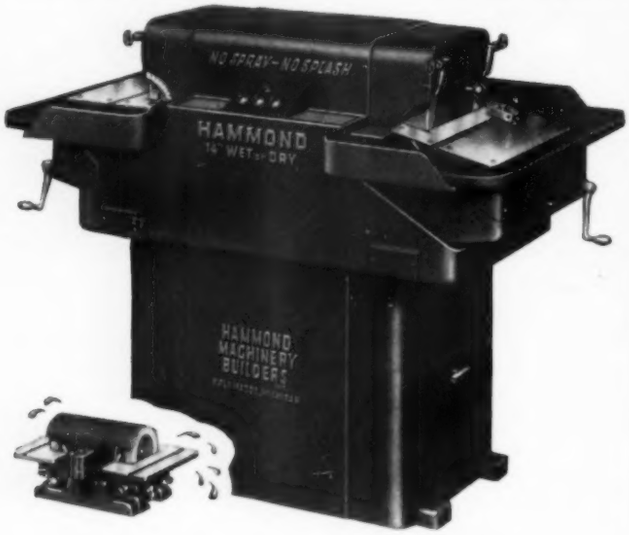
**THE CUSHMAN CHUCK COMPANY**
HARTFORD 2, CONN.

10CS48

# DON'T ASK A BOY TO DO A MAN SIZED JOB!

You wouldn't put a 98-lb. boy on the line against "Two-Ton-Tubby" because "Tubby" has the power and drive to come smashing through.

Likewise, you can't ask a small carbide grinder to stand-up against quantities of large tools. It takes the "Two-Ton-Tubby" HAMMOND 14" CARBIDE TOOL GRINDER to come smashing thru with profits, because the HAMMOND 14" has what it takes, the power and drive to cut your tool sharpening costs.



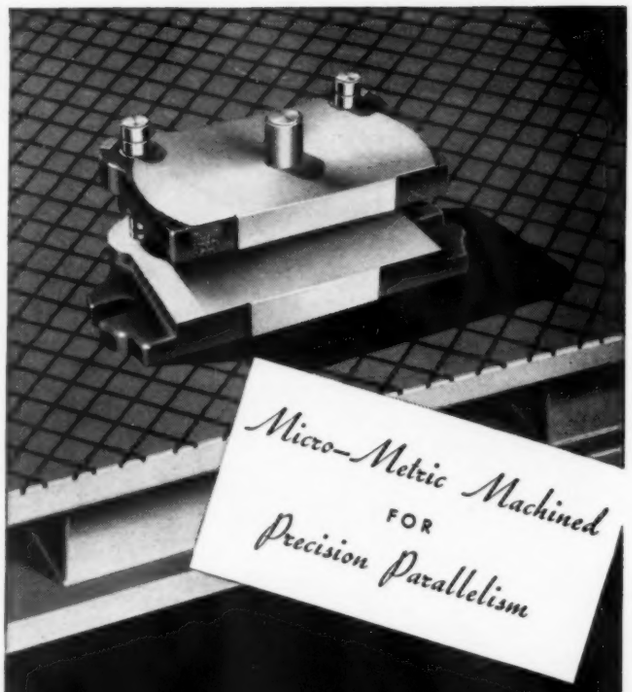

The HAMMOND 14" is a man size grinder for production carbide tool grinding and large tools.

- 3 HP totally enclosed fan-cooled motor.
- Tables are 12" x 22" with removable steel wear plates over entire surface.
- Heavy Duty construction — net wt. 2300 lbs.

It will rapidly pay for itself through better and faster grinding. Write for Carbide Grinder Catalog 220.

Hammond Machinery Builders INC.

DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN




"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

CALL "DETROIT"

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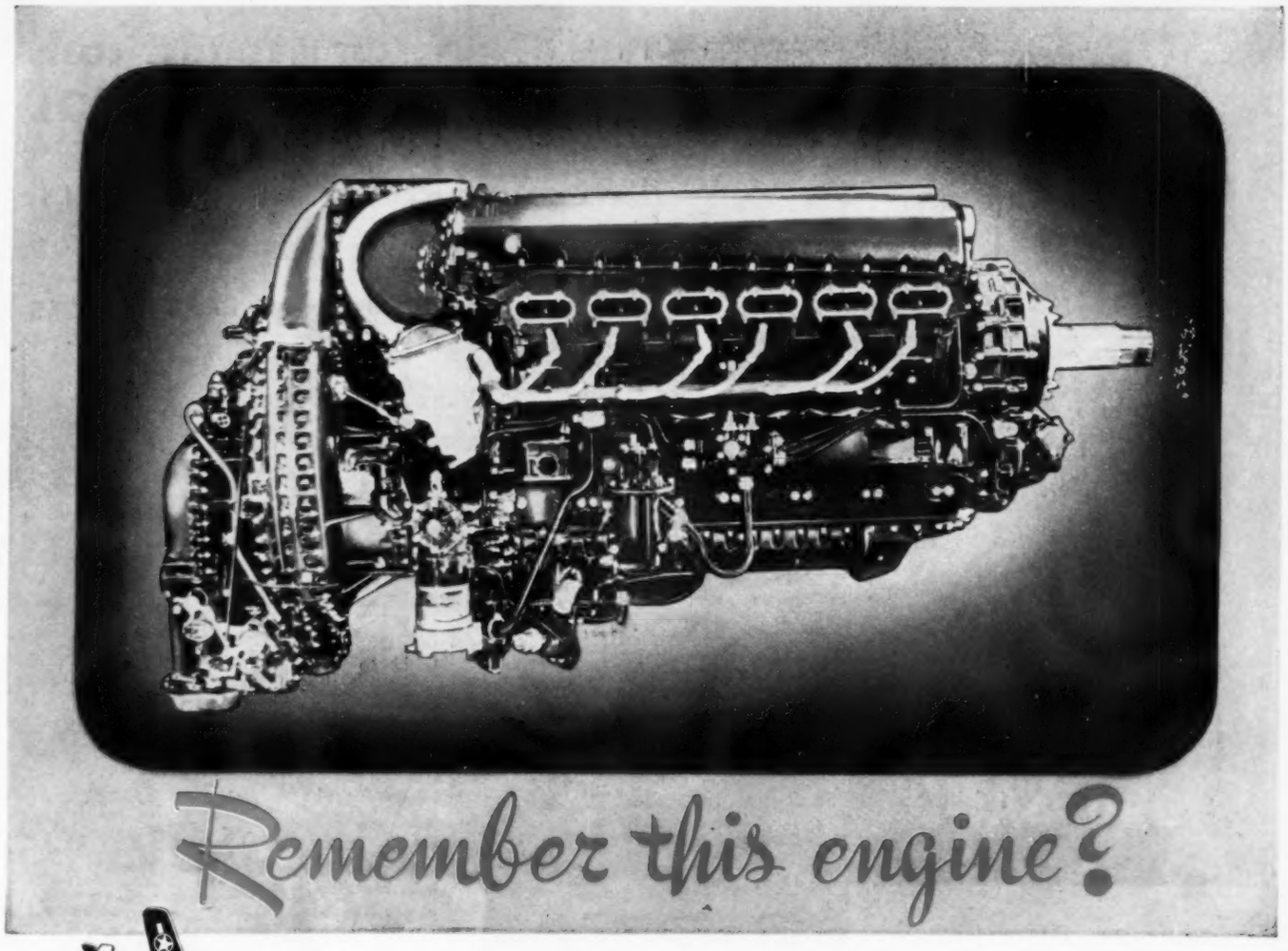
DETROIT DIE SET CORPORATION

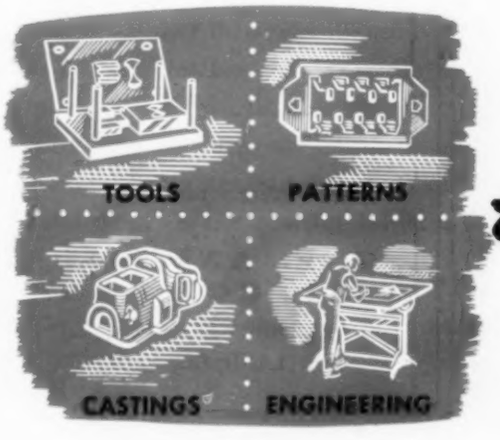
2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★



Most everyone will recall the outstanding job American craftsmen accomplished in putting the Rolls-Royce Merlin engine on a production basis in this country. We would like to point out that thousands of superb aluminum castings for this famous engine were produced in our Dayton, Ohio plant. Important today, however, is this fact: The same unique combination of Acme services so important on the Rolls-Royce Merlin job continues active today on other important work. Acme can handle your contract if you need (1) engineering service, (2) tools and dies, (3) patterns, (4) non-ferrous castings, or any combination of these four services.

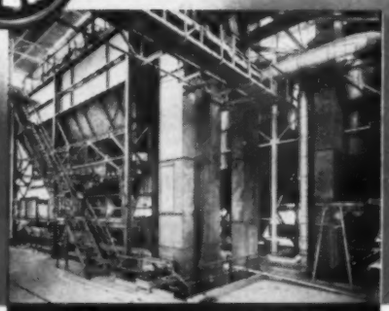
● *Send blueprints for quotations or write for details on Acme facilities.*




**Acme ALUMINUM ALLOYS, INC.**

255 NORTH FINDLAY STREET, DAYTON 3, OHIO

..of Surries and SAND



Unitcast's continuous Sand Mill that processes an average of 750 tons of molding sand per day.

The skill and patience of craftsmen that execute miniatures often compares but never attains the degree of detail . . . comprehensive detail that is required of the craftsmen who mold dependable steel castings.

For example, at Unitcast, operation of the "Sand Control" system is just *one* of many comprehensive details that only reflects in the quality of the product. During each operating hour, constant vigilance and continual testing is necessary to control the many, many elements that mix good molding sand. Such items as moisture, permeability and the like *must* be held within definite limitations to produce Unitcastings efficiently. Differences in design between incoming and outgoing jobs on the molding line upset the immediate standards and the unusual jobs require special mixtures.

Yet, it's all in the day's work. With Unitcastings, like model making, painstaking time and patience have established long records of proven standards that assure Unitcast's customers the benefit of efficient casting procedure. Take advantage of Unitcast's proven experience . . . for your next job specify Unitcastings! Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio.

In Canada:
CANADIAN UNITCAST STEEL, LTD.
Sherbrooke, Quebec

*Send for our free folder*

30 YEARS OF UNITCASTINGS

PRODUCTS LAST LONGER • BUILT WITH STRONGER UNITCASTINGS

# UNITCAST
## *Corporation*
## ELECTRIC STEEL CASTINGS

CUT INVENTORY COSTS
IN 1949 WITH **LUSOL**
THE TOOL SAVING FLUID

USE **LESS TOOLS,**
**LESS COOLANT**
AND HAVE **LESS REJECTS**
A TEST
WILL
**PROVE IT**

**THE NEW DAY COOLANT THAT SPEAKS FOR ITSELF**

The word is spreading . .
a trial will convince you

*write - wire - phone*

**F. E. ANDERSON OIL COMPANY**
212 BROWNSTONE AVE.
PORTLAND, CONNECTICUT

# THESE "Buffalo" BULLETINS *Belong* IN YOUR FILE

# *If you Drill Metal*

• The *right* drill for the operation piles up man-hour savings! That's why we want you to know about the complete line of accurate, easily operated "Buffalo" Drilling Machines—in single and multi-spindle, floor and bench types. Write for the Bulletins shown on this page—or describe your need.

### NO. 14 DRILLS

Accurate, easily handled machines that pay their way in general tool room use and manufacturing of precision parts, using the smallest commercial drills on up to ½ inch sizes. Single and multi-spindle floor or bench types. BULLETIN 2726-D.

### NO. 16 DRILLS

Sensitive machines, available in 8", 12" and 15" overhang. Drill up to ⅝" holes in cast iron. No. 2 Morse Taper. In one to six spindles. BULLETIN 2730-F.

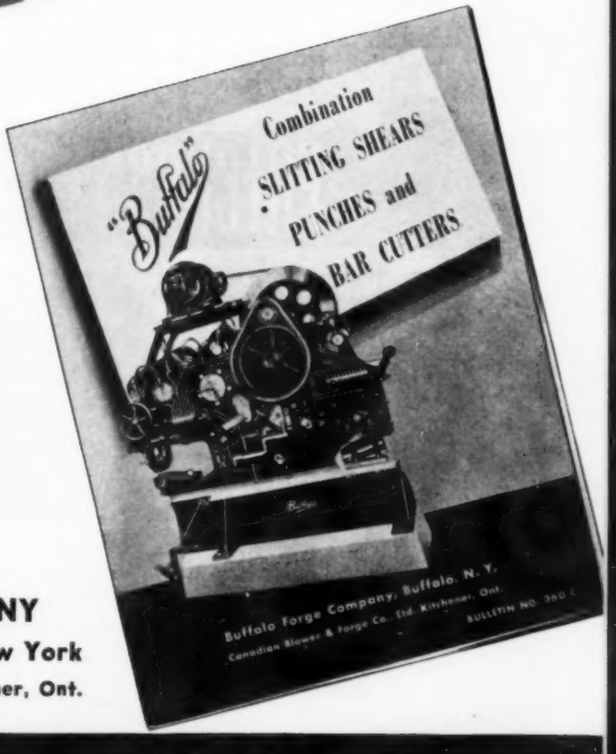
### NO. 18 DRILLS

For fast, accurate results in production and tool room work up to 1" in cast iron. Available in twelve models for just the arrangement desired in your shop. Up to six spindles, floor or bench type. BULLETIN 3123-B.

### NO. 22 DRILLS

As easily operated as smaller sensitive drills, these big machines handle up to 2" holes in cast iron! Sensitive or power feed. Single and multiple spindles. BULLETIN 2989-F.

# *If you Cut, Punch or Shear metal*




## "BUFFALO" UNIVERSAL IRON WORKERS

One of a full line of "Buffalo" power fabrication tools, the Universal Iron Worker has separate punching, shearing and bar cutting heads—allows three simultaneous operations. *Available also with built-in notcher and coper.* Bulletin 360 C, right, just off the press, is well worth your study. It gives every detail of construction and performance on these husky machines that so many foremen, engineers and operators call "the most useful machine in the shop." Write now for Bulletin 360 C!

**BUFFALO FORGE COMPANY**
**509 Broadway Buffalo, New York**
**Canadian Blower & Forge Co., Ltd., Kitchener, Ont.**

"Buffalo"

# MACHINE TOOLS

# BUZZER INDUSTRIAL *Gas* EQUIPMENT

*Reg U.S. Pat. Off.

**No Blower or Power is needed to reach High Temperatures with a "BUZZER" Gas Furnace . . . just connect to your gas supply.**

*Rectangular Heat Baths*

For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

BUZZER Rectangular Heat Baths meet the increasing demands for large liquid Heat Bath Furnaces, and are built in many sizes. Also made in round type pot furnaces

Send for the new BUZZER Catalog showing full line of Gas Furnaces, Burners and other equipment.

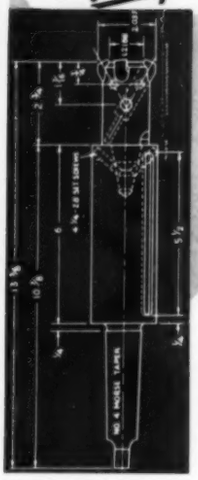
*Full Muffle Furnace (Bench Type)*

**CHARLES A. HONES, INC.**

**121 South Grand Avenue Baldwin, L. I., N. Y.**

MADE BY MAKERS OF ERICKSON PRECISION COLLETS, CHUCKS, AND MANDRELS

## Put ERICKSON-STATE'S 4 CUTTERS to work on that *Tough* Boring Bar Job!



*Big auto manufacturer uses special design to cut cost of boring connecting rods.*

Full-depth boring in blind holes; faulty cores straightened out.
Long tool life, expansion range permitting many regrinds.
Shanks to suit any need.
Close, easy fine thread adjustment — easily accessible.
Rigid locking — non-chattering — accuracy.

Famous 4-cutter principle brings big advantages: faster feeds and speeds; extra expansion gives more regrinds; exclusive locking insures bit rigidity and cuts adjusting time for regrinding or changing bore diameters; handles difficult operations, various hole sizes, within 1⅛" to 5½" range; bits replaced easily and inexpensively. Many special adaptions lick unusual jobs.

Get details also about Erickson-State Adjustable Core Drill for heavy jobs.

*Ask for Bulletin A-11*

**ERICKSON TOOLS DIVISION**

**2302 Hamilton Ave. • Cleveland 14, Ohio**

**ERICKSON = *Collet Chuck Precision***

**D.A. Stuart Oil Co.**

ESTABLISHED LIMITED

2729 SOUTH TROY STREET, CHICAGO 23, ILL.

STUART *service goes with every barrel*

**BAUMBACH** *The* **DIE SET AUTHORITY**

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

**E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.**

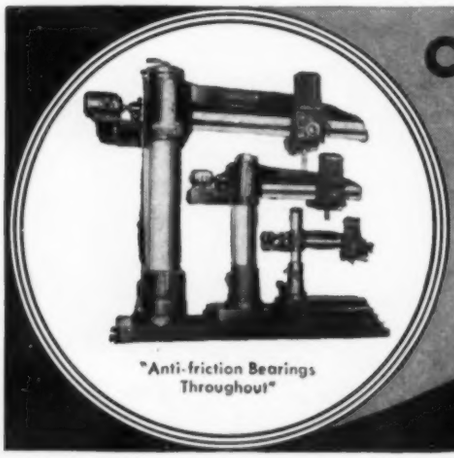
## *Make a Time Study*

OF

## NICHOLSON EXPANDING MANDRELS

Time studies show that, with these widely used precision tools, operations can frequently be completed in less time than was formerly consumed in locating or turning a solid arbor. Set of 19 does work of 209 solid arbors. Two types. Sold singly or in sets; for bores ½" to 7". BULLETIN 1043.

**W.H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.**



"Anti-friction Bearings Throughout"

## CARLTON RADIAL DRILL

**FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.**

# THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

# BAUSH Cam-Hydraulic-Electric...

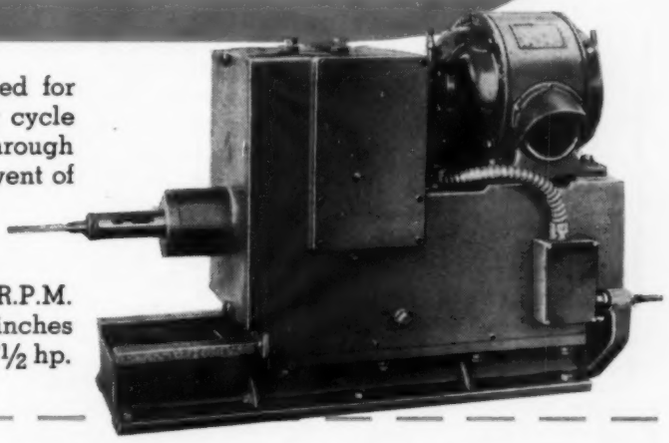
# POWER UNITS!

## Self-Contained—Dependable—Efficient

These Baush Power Units are adaptable for drilling, reaming, countersinking, boring or counter boring, and the No. 5 Electric Unit is also adaptable for tapping.

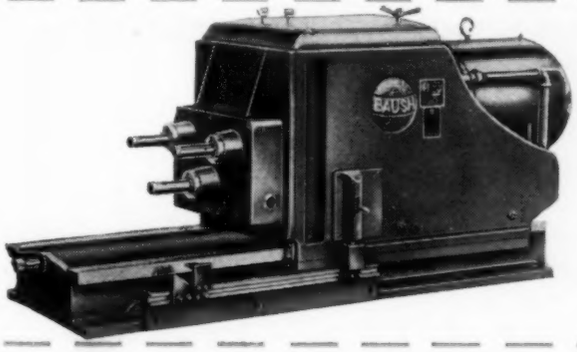
Designed for utility in different constructions, such as Vertical, Horizontal or Angular installations, these Units are built for rugged and continuous production.

A phone call — wire or letter will bring you complete engineering data.



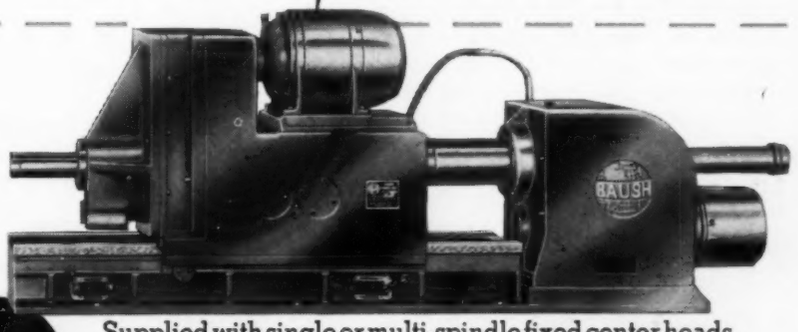
BAUSH CAM FEED POWER UNIT . . . Unexcelled for simplicity on production work. Complete operating cycle controlled by one revolution of cylinder cam through limit switch. Overload clutch prevents damage in event of tool breakage. Fixed center multi-spindle head can be attached to flange mounting. Desired tool speed secured by interchanging pick-off gears.

Spindle Speeds: . . . . . 150 to 1250 R.P.M.
Stroke: . . . . . Model #1—6 inches: Model #2—8 inches
Motor: . . Model #1—Up to 3 hp: Model #2—up to 7½ hp.




BAUSH HYDRAULIC FEED POWER UNIT . . .
Has self-contained hydraulic system — hardened and ground steel ways — large flange for mounting drill heads.
Spindle speeds easily changed by pick-off gears.
Rapid traverse — dwell or jump feed obtainable if desired.
Spindle Speeds: . . . . . 170 to 930 R.P.M.
Variable Feed Rates From ½" to 20" /min.
Stroke: . . . . . 12" Standard, 18" or 24"
Motor: . Model #20—up to 7½ hp: Model #30—up to 15 hp.

BAUSH #5 ELECTRIC LEAD SCREW POWER UNIT . . .
This Unit is of center feed construction insuring more accurate drilled holes and is readily adapted for boring and facing as well as tapping.




Supplied with single or multi-spindle fixed center heads, these units incorporate many outstanding features:
Traverse speeds of 120" — 150" per min. through 2 hp disc brake rapid traverse motor.
Spindle Speeds of 145 — 1650 R.P.M.
Feed Rates easily controlled through pick-off gears.
Spindle drive motors can be furnished in either 3, 5 or 7½ hp. Stroke: From 12" up to 30" as required.

**BAUSH**
**MACHINE TOOL CO.**
**SPRINGFIELD 7, MASSACHUSETTS**

No. 3 in a series of performance case histories

# Grant REDUCER in use 20 years . . . NOT A PENNY SPENT ON MAINTENANCE

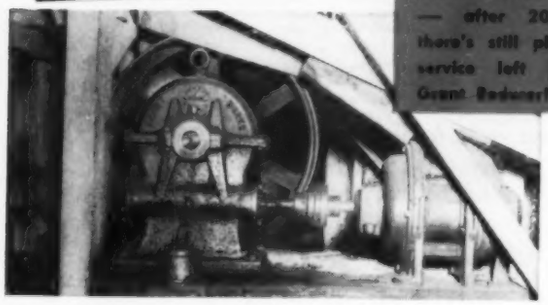
. . . H & P Spool and Bobbin Co., Lawrence, Mass., gives the details of another great performance story:

H & P SPOOL & BOBBIN COMPANY

LAWRENCE, MASSACHUSETTS

Early in 1928 we installed a Grant 5⅝" Model B Worm Gear Reduction Unit as the driving medium on a horizontal conveyor. This Unit gave a reduction in speed of 33 - 1, power being supplied by a 2 H.P., 1200 R.P.M. Motor directly connected to the reduction unit by a flexible coupling. This Unit has operated approximately thirty hours per week since installation, without attention or repair except for regular cleaning and lubrication. A good record for a good unit.

Here's the installation — after 20 years there's still plenty of service left in this Grant Reducer!



Performance stories like the one above don't "just happen". Grant Reducers perform years longer without maintenance because they are designed and built from the finest materials with utmost precision. All Grant Reducers are equipped with radial thrust ball bearings, oil seals, gears of high test bronze, worms of chrome vanadium steel and many others.

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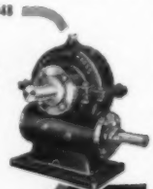

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SPUR, BEVEL, WORM, SPIRAL, HERRINGBONE AND RACKS, ETC.

# A GOOD HABIT to GET INTO...!

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We of the Cincinnati Gear Company are specialists in the manufacture of gears to meet specific needs. Our modern plant is equipped with the finest and most accurate equipment for the control and production of GOOD gears.

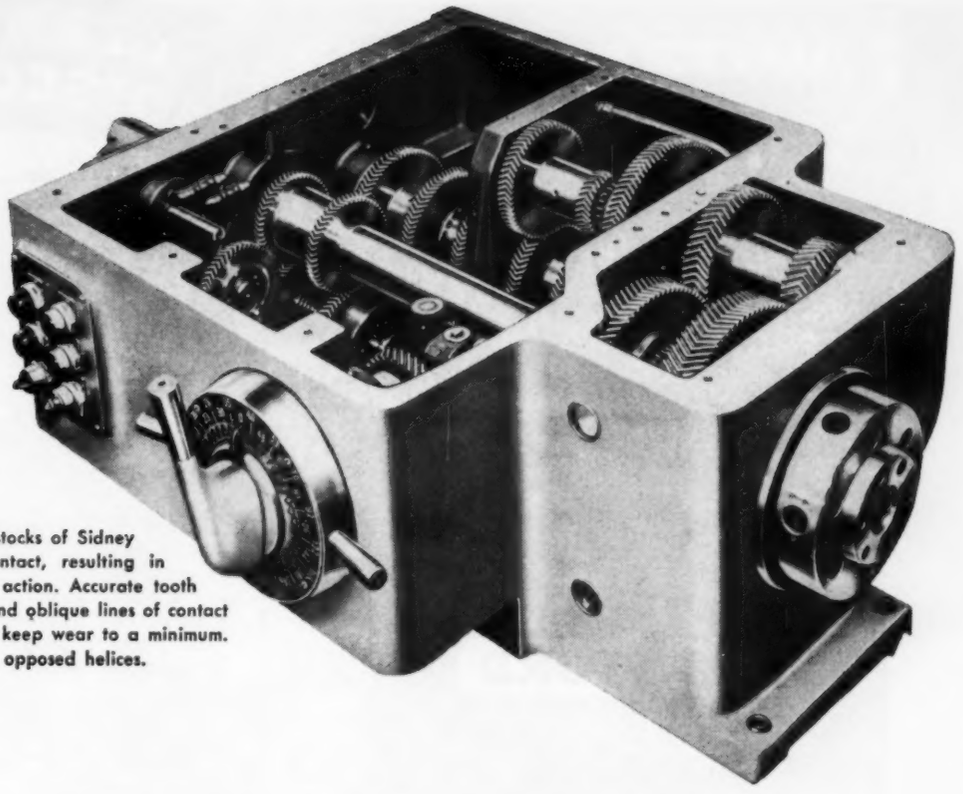
For distinguished service in job performance let Cincinnati Gears, Good Gears Only, work for you . . . it is a good habit to get into.

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio



Farrel-Sykes gears in the headstocks of Sidney lathes provide more tooth contact, resulting in greater strength and smoother action. Accurate tooth contour, gradual engagement and oblique lines of contact assure correct tooth action and keep wear to a minimum. End thrust is eliminated by the opposed helices.

# THESE PC* GEARS PROVIDE

## "a smoother rolling action"

The Sidney Machine Tool Company first started using Farrel-Sykes, continuous tooth, herringbone gears in their lathes some twenty years ago. In their own words:

"... We have met with considerable success in their use, and especially so in the last years when so many manufacturers have turned to the use of carbide-tipped cutters, as we find in this transmission a smoother rolling action which materially prolongs the life of carbide-tipped cutters. We employ this type of transmission throughout our entire line of 16-speed and 32-speed lathes."

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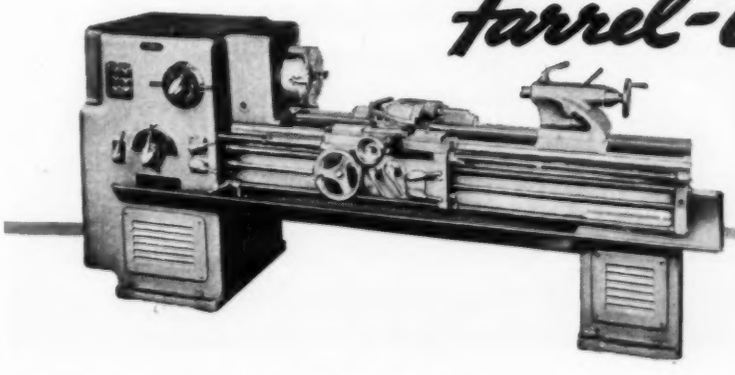

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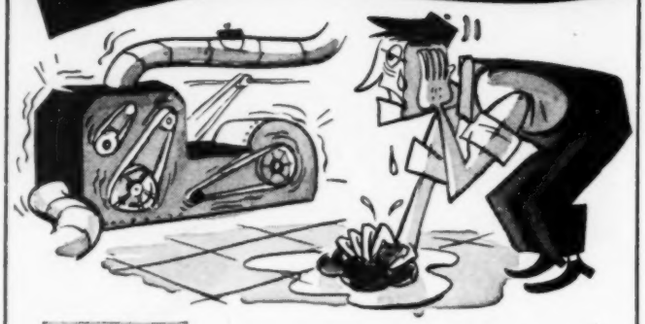

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V Belt Flywheel Drive.

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THE gear, pinion, V-belt flywheel drive for clutch assembly of this giant production machine were cast and machined at National-Erie. The gear is .40-.50 carbon steel, 127 inch diameter with 14 inch face. The pinion is Neloy alloy steel; rough turned, heat treated and hardened; finish machined . . . then the teeth are flame hardened. The V-belt flywheel drive is .40-.50 carbon steel, rough weight 25,640 pounds.

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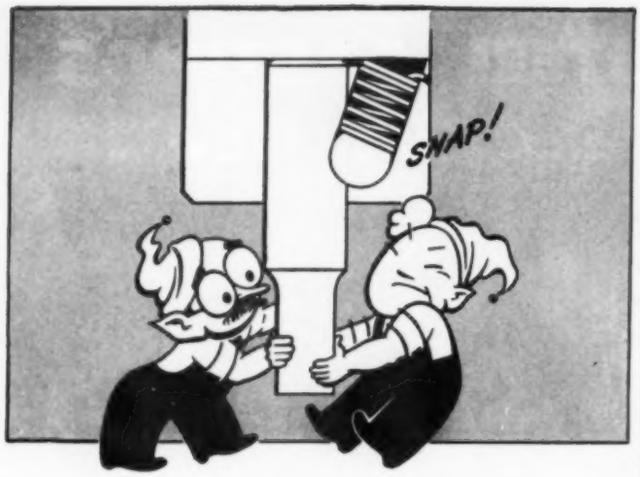


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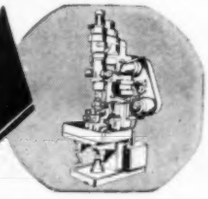

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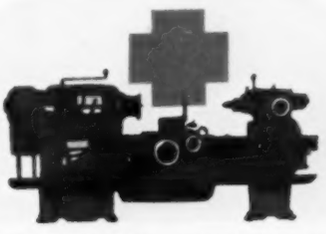

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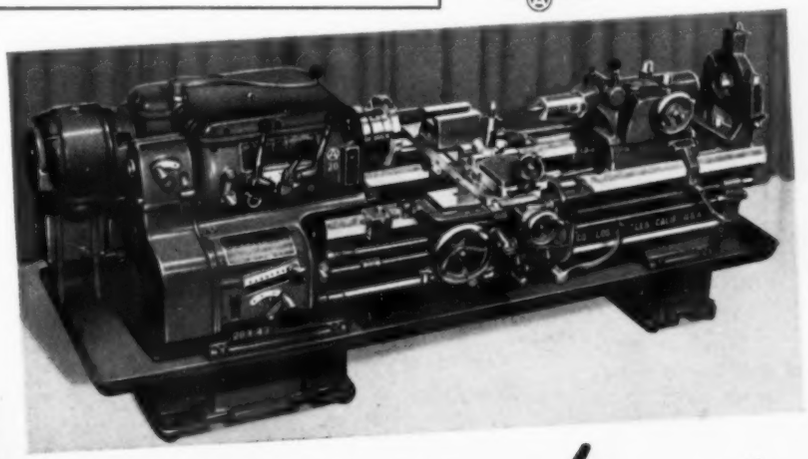

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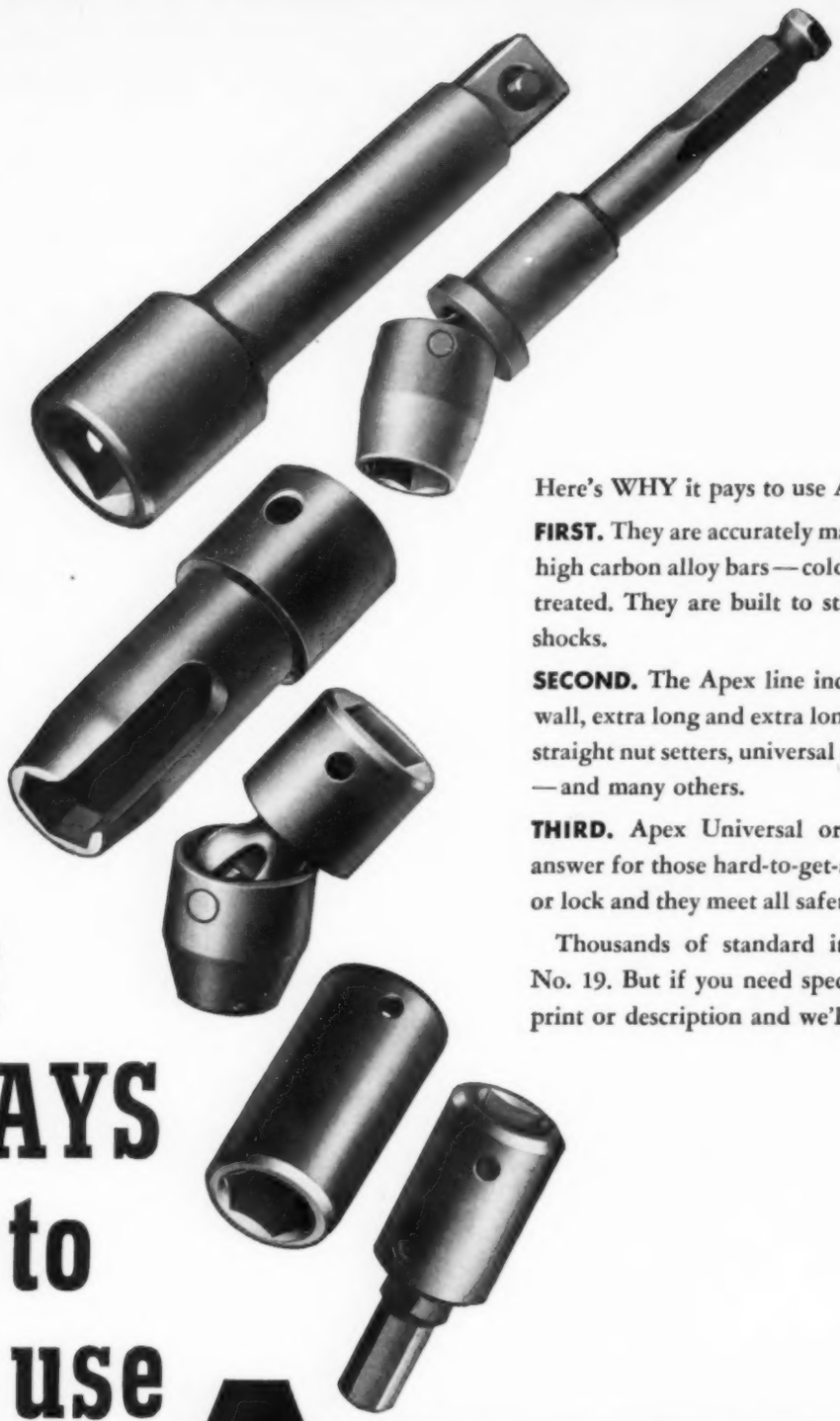

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# FREE LITERATURE

## New Catalogs, Booklets, Bulletins

### MACHINES AND ATTACHMENTS

**1** SHEARS — Cincinnati Shaper Co., Cincinnati 25, Ohio. 32-page bulletin S-5 illustrates and describes Cincinnati shears said to cut to micrometer accuracy. Specifications on the all-steel shears are included.

**2** BORE-MATICS—Heald Machine Co., Worcester 6, Mass. 16-page bulletin contains information on the torque-converter transmission which is precision-finished on Heald equipment. Booklet is thoroughly illustrated.

**3** RIVETERS — Hanna Engineering Works, Chicago 22, Ill. Two, 16-page bulletins, 244 and 246 respectively, give information on pneumatic yoke riveters and rapid riveters made by Hanna.

**4** THREADING MACHINE—The Lees-Bradner Co., Cleveland 11, Ohio. 8-page bulletin 75 covers the Sentinel Cri-Dan, a semi-automatic high-speed threading machine for single-point threading. Threads are cut at speeds up to 100 passes per min.

**5** TAPPING, THREADING ATTACHMENT—Ettco Tool Co. Inc., Brooklyn 6, N. Y. 6-page folder 22, describes the Ettco-Emrick tapping and threading attachments for drillpresses. The folder lists seven sizes of attachments for No. 0 to ¾-in. taps and No. 6 to ⅝-in. dies.

**6** CRANK SHAPERS — General Engineering & Mfg. Co., St. Louis 16, Mo. 24-page catalog in three colors covers the GEMCO line of multi-purpose crank shapers. Specifications on the plain, production, and universal models are included.

**7** LATHES, SHAPERS, MILLING MACHINES — Sheldon Machine Co. Inc., Chicago 41, Ill. 16-page bulletin G-48 illustrates and describes the post-war Sheldon and Sheldon-Vernon machine tools including lathes, shapers, and milling machines, as well as accessories and attachments.

**8** LATHES, TURRETS — Enco Mfg. Co., Chicago 39, Ill. 16-page bulletin 48 shows typical applications of turrets on actual jobs. The Enco carriage Hexturret is illustrated for lathes from 9- to 32-in. swing.

**9** BROACH SHARPENER — Colonial Broach Co., Detroit 13, Mich. 12-page bulletin S-48 contains information on machines for sharpening flat and round broaches. Specifications covering all models are included.

**10** DRILLPRESSES — South Bend Lathe Works, South Bend 22, Ind. 8-page bulletin 400 covers the bench and floor models of the 14-in. precision drillpresses, as well as drillpress attachments and accessories.

**11** LATHES — The American Tool Works Co., Cincinnati 2, Ohio. 4-page folder 16-C illustrates and describes the American 20-in. medium-duty Pacemaker lathe. Bulletin is a supplement to Bulletin No. 16.

**12** HYDRAULIC PRESSES — The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. 12-page folder 4804 is a review of the complete HPM line, including metal drawing presses, forging, forcing, shaft-straightening, briquetting, and other machinery.

### TOOLS AND ATTACHMENTS

**13** RELAYS, TIMING DEVICES — Potter & Brumfield, Chicago 6, Ill. 20-page catalog 148 covers with specifications company's line of relays and electrical timing devices.

**14** AUTOMATIC CONTROLS—Leeds and Northrup Co., Philadelphia 44, Pa. 40-page catalog ND4A (1), revised, gives information on precision-adjusting control. The automatic electrically-actuated equipment can be used for regulating temperature, electrolytic conductivity, and other uses.

**15** CARBIDE-TIPPED ADJUSTABLE REAMERS—Wendt Sonis Co., Hannibal, Mo. 3 single sheets cover company's new carbide-tipped adjustable reamers standard insert-tooth cutter, and B-D cut carbide-tipped reamers.

**16** ELECTRIC-AIR CONTROLS — Pneu-Trol Devices, Inc., Chicago 18, Ill. 22-page folder covers electro-pneumatic controls which permit conversion of standard machine tools and fixtures to automatic and semi-automatic production units.

**17** GAS ANALYZER — Burrell Technical Supply Co., Pittsburgh 19, Pa. 8-page bulletin 213 is entitled "Burrell Industro Gas Analyzer." The Industro Gas Analyzers are for the rapid control analysis of gas mixtures comprised of carbon-dioxide, carbon-monoxide, methane, oxygen, hydrogen and nitrogen.

**18** MICROMETERS, CALIPERS, GAGES—George Scherr Co., New York 12, N. Y. 12-page booklet covers the line of micrometers, vernier calipers and height gages, as well as other machinists' tools for toolmakers and mechanics. A number of newly developed specialties for precision work are included.

**19** ANALYTICAL INSTRUMENTS—Consolidated Engineering Corp., Pasadena 4, Calif. 16-page bulletin 1300A covers analytical instruments such as spectrometers, recording oscillographs, leak detectors, and electrical computers.

**20** MICROSCOPES—Bausch & Lomb Optical Co., Rochester 2, N. Y. 20-page catalog D-15, thoroughly illustrates and describes the stereoscopic wide-field microscopes.

**21** POTENTIOMETERS—The Brown Instrument Co., Philadelphia 44, Pa. 32-page catalog 15-13, contains information on Electronik potentiometers and includes schematic diagrams, photographs and dimensional drawings.

**22** TOOLS — Chicago Latrobe Twist Drill Works, Chicago 10, Ill. Catalog printed in yellow, red, and black has a plastic laminated cover, is indexed, and is of the loose-leaf type. Catalog contains all Chicago-Latrobe tools along with new dimensions. Space is given to technical and helpful facts on drills and reamers.

**23** TIPS, TOOLS—Firth Sterling Steel & Carbide Corp., McKeesport, Pa. 28-page bulletin FE-127 lists and describes line of sintered tungsten-carbide tips and tools, boring bits, Mechanigript adjustable tool holders, and also special parts.

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## HEAT-TREATING AND WELDING

**24** HEATING SYSTEMS—Dresser Industries, Inc., Cleveland 13, Ohio. 48-page pocket-size booklet lists products and services of Dresser Industries. Materials included cover the gas-fired heating systems and automatic water heaters built by Dresser.

**25** METALLIZING — The Metallizing Engineering Co., Long Island City 1, N. Y. 8-page folder 401 includes metallizing equipment, accessories and supplies. Included are three new accessories: a wire control and straightener unit, a gas-flow meter unit, and an air-control unit.

**26** GAS UNIT HEATERS—The Automatic Gas Equipment Co., Pittsburgh 21, Pa. 4-page folder illustrates and describes the Pittsburgh gas unit heater, Series C, featuring cast-iron heat exchangers. Specifications for six sizes are included.

## PLANT SERVICE EQUIPMENT

**27** CONOIDAL FANS—Buffalo Forge Co., Buffalo, N. Y. 68-page bulletin 3675 covers with illustrations the various types of fans offered. Specifications are included.

**28** OVERHEAD TROLLEY CONVEYOR—Smith Power Transmission Co., Cleveland, Ohio. 4-page folder 551 gives specifications and complete details on the conveyor which is called the FlexoiD overhead-trolley conveyor.

**29** VENTILATING PRODUCTS — Schwitzer-Cummins Co., Indianapolis 7, Ind. 4-page folder covers various ventilators, fans, blowers, and blower wheels manufactured by the company.

**30** FLOOR COATINGS—Endur Paint Co., Boston 8, Mass. 4-page folder covers the Endur carborundum floor coatings giving samples of various colors for use to eliminate slippery floors and for extraordinary wear.

**31** ROTARY PUMPS, AIR COMPRESSORS — Gast Manufacturing Corp., Benton Harbor, Mich. 8-page folder includes information on Gast rotary vacuum pump to 28 in., air compressors to 30 lb., and air motors from 1/20 to 1 hp.

## PARTS AND MATERIALS

**32** DIE CASTING — Stewart-Warner Corp., Chicago, Ill. 112-page catalog spirally bound and with a plastic cover, covers important phases of die casting in zinc, aluminum, magnesium, and copper alloys. It describes and indicates applications of die castings, accepted practices in product design, die design and selection of alloys and finishing.

**33** MICROCASTING—Microcast Div., Austenal Laboratories, Inc., New York 16, N. Y. 16-page folder explains the Microcast process for the casting of a non-machinable cobalt-chromium-molybdenum alloy with a melting temperature in excess of 2500 F.

**34** AUTOMATIC SHAFT SEALS — Schwitzer-Cummins Co., Indianapolis 7, Ind. 28-page spirally-bound folder contains information and specifications on automatic shaft seals, featuring all metal parts inclosed and protected against corrosion.

**35** PRECISION BEARINGS — McGill Mfg. Co. Inc., Valparaiso, Ind. 78-page folder includes guide bulletins on the ball and multi-roll full-type roller bearings. Various types under these categories are covered.

**36** PIPE, TUBE FITTINGS — Commonwealth Brass Corp., Detroit 8, Mich. 24-page catalog 48 covers pipe and tube fittings and includes ball solderless fittings, threaded-sleeve fittings, standard-pipe fittings, flared-tube fittings, inverted-flare fittings, and needle valves.

**37** MACHINING MEEHANITE — Meehanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y. 24-page bulletin, "How to Machine Meehanite Castings," gives tool angles, cutting speeds, and performance reports on various kinds of machine tools and tooling setups.

**38** COLLOIDAL GRAPHITE — Acheson Colloids Corp., Port Huron, Mich. 14-page booklet gives information on Dag colloidal graphite which consists of microscopic particles of graphite dispersed or diffused in various liquids, depending on operating conditions and requirements.

**39** ALUMINUM ALLOYS AND MILL PRODUCTS — Reynolds Metals Co., Lousiville, Ky. 162-page catalog, spirally bound, covers a wide range of related subjects such as the alloy designation system, the temper designation system, heat-treatable and non-heat-treatable alloys, castings alloys, casting methods and foundry practice. The book is complete with 163 tables of data.

**40** EBONOL BLACKENING PROCESS—Enthone Inc., New Haven, Conn. 8-page folder illustrates and describes the Ebonol coloring and blackening process for metal, a method for direct oxidation at low temperatures of copper and copper alloys to black adherent cupric oxide.

**41** SPEED REDUCERS—Euclid Machine & Tool Co., Cleveland 10, Ohio. 24-page booklet 201 covers the varied models, dimensions and specifications.

**42** OUTLETS—Bonney Forge & Tool Works, Allentown, Pa. 20-page bulletin covers the Bonney WeldOlet for branch pipe outlets. The WeldOlet fittings and flanges are described.

**43** STEEL TUBING—Joseph T. Ryerson & Sons, Inc., Chicago 80, Ill. 32-page bulletin gives information on seamless and welded carbon-steel tubing, stainless tubing and pipe, structural tubing, and seamless and welded boiler tubes.

**44** SALT AS A CORROSION PROBLEM—The International Nickel Co., New York, N. Y. 20-page booklet describes the part played by corrosion control in the production of salt, and the use of brine solutions by chemical and food processors.

**45** MAGNETIC CHUCKS — Hanchett Magna-Lock Corp., Big Rapids, Mich. 18-page bulletin 047-1 covers Hanchett Hermeti-Coil magnetic chucks and accessories. Chucks are offered in three types: rectangular, rotary, and swiveling.

**46** RETAINING RINGS—Truarc Div., Waldes Kohinoor, Long Island City 1, N. Y. 28-page booklet gives engineering specifications and data in a chart form.

**47** MINIATURE BALL BEARINGS—Miniature Precision Bearings, Inc., Keene, N. H. 8-page bulletin contains over 40 types and sizes of standard miniature ball bearings including radial, super-light, pivot bearings, and others, ranging in O.D. from 2 mm. to 5/16 in.

**48** RECESSED HEAD SCREWS—H. M. Harper Co., Chicago 18, Ill. 24-page bulletin is entitled "How to Select Recessed Head Screws for Practical Production Driving."

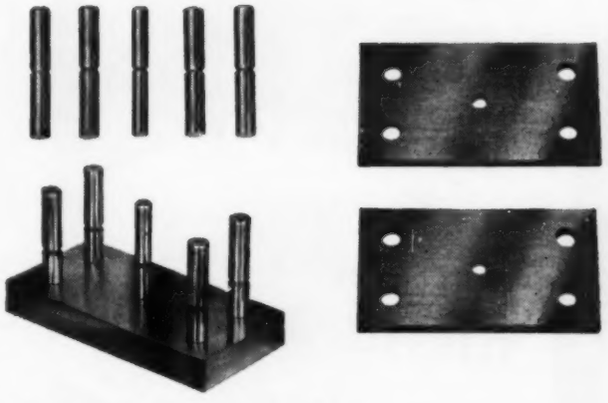
**49** STANDARD SPECIALTIES—The International Nickel Co., Inc., New York 5, N. Y. 24-page booklet entitled "Standard Specialties," lists about 200 standard products for corrosive and high-temperature service.

**50** RUST-PREVENTIVE PRODUCTS —Rust-Oleum Corp., Evanston, Ill. 1948-49 catalog covers company's line of rust preventive products. Problems of scientific rust control, together with directions for use and application of Rust-Oleum are given.

# 3 Hole Grinding Problems { CAN YOU ESTIMATE THE TIME?

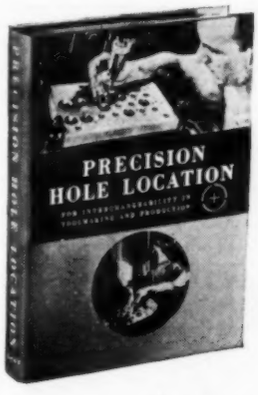
**TWO-STATION DIE BLOCK**

All holes ground to exact size and location. Blank hole and center piercing hole ground with one half degree included taper. Little clearance permissible between punch and die. *2¾ hrs. on the Moore Jig Grinder.*



**TEN HOLES IN MASTER PLATES**

Hardening distortion corrected in two plates. Ground to size and location *independently* and to plug gage fit in any of the four possible positions. *3½ hrs. on the Moore Jig Grinder.*

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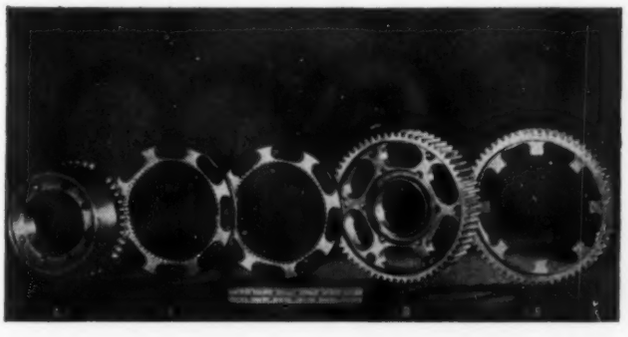
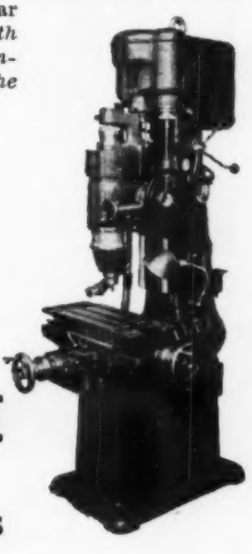
An entire chapter of this authoritative handbook on toolmaking practices is devoted to an engineered solution to the problem of correcting holes by Jig Grinding. Over 5,000 copies have been sold to date. Available at special price of $3 in U.S.A.; $3.50 outside U.S.A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.



**FIVE ACCESSORY GEARS IN MASS-PRODUCTION**

*Gear A:* Eight holes on circle ground to size and location within ±.0003"...*Gears B, C, D, E:* Radii at ends of elongated pockets ground to size and location within ±.0003"...*Gears B, C:* Radii ground to shoulder near bottom of pocket within ±.0005". *With special indexing fixture, 4 aircraft engine gears per hour finished on the Moore Jig Grinder*



**"Correcting Hole Location Within Less Than .0001"** is the title of our new 28-page catalog which describes the operation and applications of the Moore Jig Grinder to dies, drill jigs, gage parts, master plates and production parts. Write for your copy today.
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| "MO-CUT" . Braeburn Alloy Steel Corp. | "TATMO" . . . Latrobe Electric Steel Co. |
| "STAR MAX" . . . . Carpenter Steel Co. | "MIDMAX" . . . . . The Midvale Co. |
| "MOLITE M-1" . Columbia Tool Steel Co. | "S. T. M." . . . Simonds Saw & Steel Co. |
| "REX T-MO" . Crucible Steel Co. of America | "MO-TUNG" Universal-Cyclops Steel Corp. |
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Material — Seamless steel
Hole size — from 1" to 2¾" dia.
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Production rate — 20 cutters per hour

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**"Low-cost production of precision holes"**

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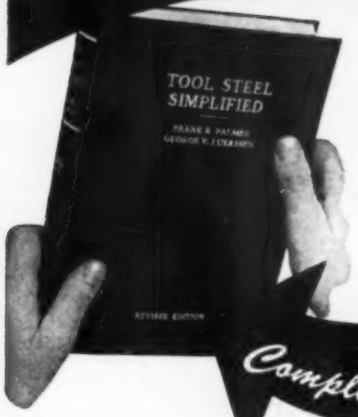


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564 Pages 355 Illustrations
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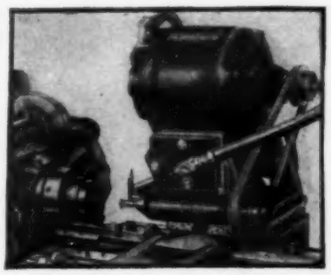
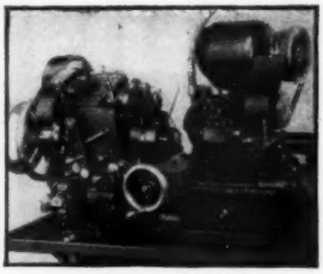


*Machine with Internal Milling Attachment*



*Machine equipped with Relieving Mechanism*

**Flexibility for handling unusual work assured by availability of special attachments**

In addition to producing all standard forms of threads, the Waltham Thread Miller, with special equipment, can be used for relieving, internal threading and plain taper work. Other equipment, also available, extends its utility to multiple cutting automatic cam control and metric thread cutting.

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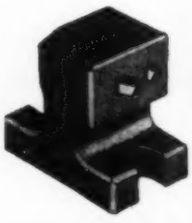

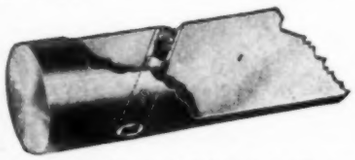

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**BUSHINGS MADE IN FOLLOWING SIZES:**
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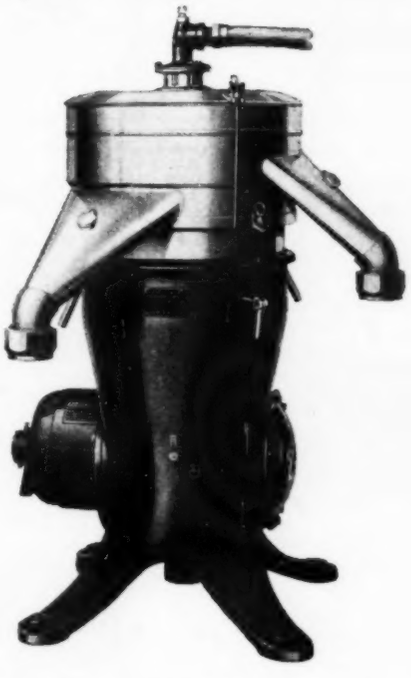

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YOU save more than the cutting oil when you remove metallic chips or dirt by means of a De Laval centrifugal Oil Purifier. You also add to the life of the machines and tools, and—very important—you insure faster, more accurate work.

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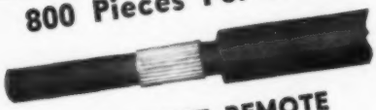

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34½" LONG

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*Cam-actuated, triple-die*

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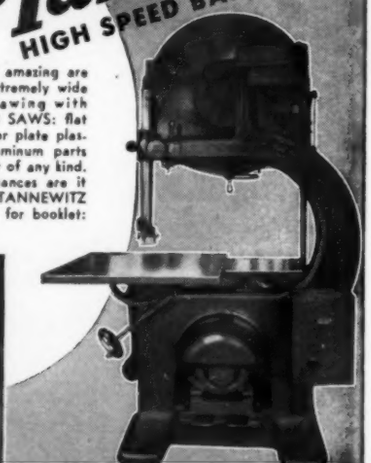

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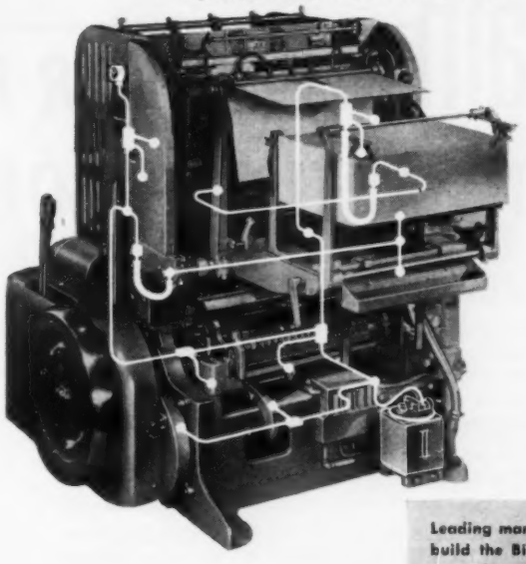

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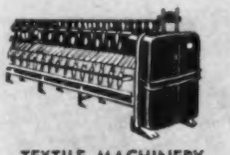

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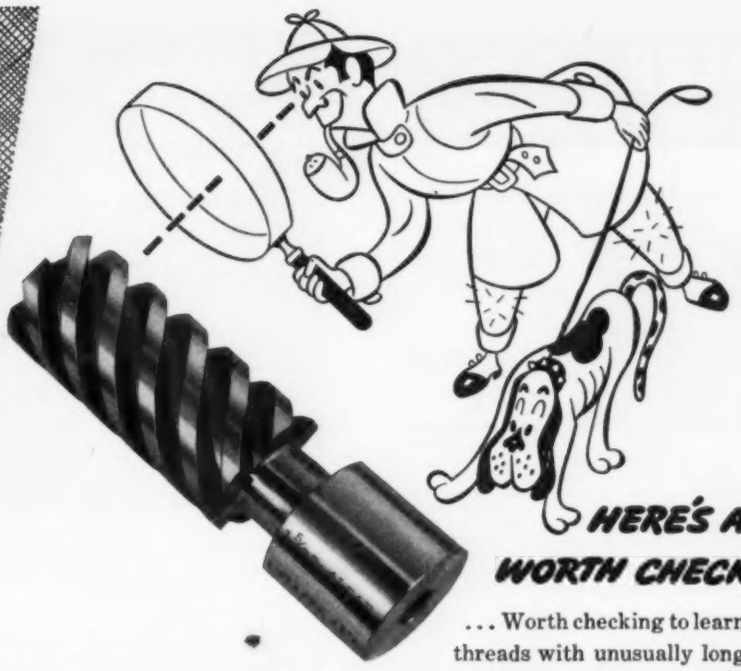
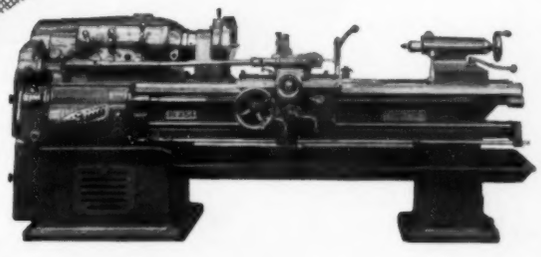


## HERE'S A LEAD WORTH CHECKING..

... Worth checking to learn how easily threads with unusually long leads can be produced on the Hendey 16 x 54 lathe equipped with a Sub-Headstock. The six start worm shown above has a major diameter of 1-5/8" and a lead of 4". Producing a thread with such a long lead can impose severe strains on a lathe. Frequently, tolerances cannot be met. The Hendey lathe with Sub-Headstock avoids these problems by a unique gear arrangement. The Sub-Headstock driving plate revolves one turn to six turns of the lathe spindle. This reduces the load on the lathe to allow the chasing of threads with leads beyond the range given on the index plate.

Better check today on Hendey Precision lathes. They are manufactured in a wide range of sizes and capacities to suit every tool room use. Features include hardened and ground ways, preloaded roller bearing mounted spindles, precision lead screws and automatic lubrication. Write today for complete information.



HENDEY 18-SPEED 16 x 54 PRECISION LATHE

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"- 24"- 28"

THE **hendey** MACHINE COMPANY

*MAIN OFFICE & PLANT:* TORRINGTON, CONN.

*BRANCH OFFICES:* New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

*REPRESENTATIVES:* Philadelphia, Cleveland, Pittsburgh

**hendey**

# SCHERR aids to precision – production

**Visual precision inspection for all shops—**

**WILDER Model B MICRO PROJECTOR**

An instrument priced for any shop's budget, that will save its cost many times by preventing rejects. Spot-checking with the Wilder at the start and during a production run, instantly reveals any tendency to go beyond tolerance due to wear of tools or other cause. This is a bench type tool, with an almost vertical screen, on which the magnified image is thrown, and a conveniently placed work stage. Designed and built for continuous quantity inspection. Priced unusually low. Write. Also in Model A for general use.

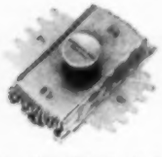
**Fast and accurate inspection with the COMPARITOL**

Where inspection accuracy to "Tenths" and better is absolutely essential in such parts as gages, threads, fine wires, cylindrical ground work, etc., the Scherr Comparitol will give indisputable results. It can be used by anyone with a few minutes' instruction, can be placed near machines for constant spot inspection, as well as used for final inspection. Long-lived patented knife-edge mechanism needs no oiling, has no gears racks, multiple levers, pivots or bearings, no electrical connections, bulbs or transformers. Thousands in profitable use everywhere. Price —complete with serrated table 6", $165.00—8", $185.00.

**Check mikes and gage blocks with OPTICAL FLATS**

Essential for checking wear and flatness of lapped surfaces. Reveal deviation in millionths from absolute flatness or parallelism of micrometer anvil, gage blocks, refrigerator, airplane parts, etc. Sizes up to 4" or over in quartz. Full details on request.

**Measure gear pitch quickly**



**SCHERR GEAR GAGE SET**

Any diametrical pitch, from 3 to 64, obtained instantly without counting teeth, measuring gear diameter, or other computation. Used like a thread gage. Teeth are cut in stainless steel segments by Fellows gear generating method, on true arc. Here is something the gear-using world has long needed. Complete set, $12.50. In ordering, specify 14½ deg. or 20 deg. P.A.

*Write for full details on these tools, and for the Scherr Small Tool Catalog.*

**GEO. SCHERR CO., Inc.**

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# On C-F Positioners

When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made downhand—that's efficient welding!

Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

*Write for Bulletin WP24—an illustrated circular detailing the specific advantages of C-F Positioners.*

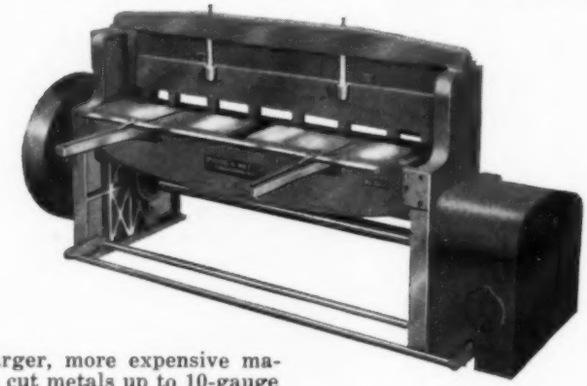
**CULLEN-FRIESTEDT CO.**

**1313 S. Kilborn Avenue Chicago 23, Ill.**

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

# SPEED PRODUCTION, CUT OVERHEAD

**with Wysong and Miles Power Squaring Shears**



Using larger, more expensive machines to cut metals up to 10-gauge adds unnecessary production overheads. The Wysong and Miles 10 Gauge Shears, 6 foot and 8 foot in width, can do much of the work you are now routing to larger machines.

That's one reason the Wysong and Miles 10 Gauge squaring shears are ideal auxiliary machines. Relatively inexpensive, in both initial investment and operating costs, they are precision machines with an accent on accuracy and speed.

An important feature is the compensating holddown, with a spring actuated plunger in each foot. Even small strips are clamped firmly without adjustment.

The ball-bearing back gauge is set by a handwheel dial reading, adjustable to .0078 (1/128th) of an inch. Taper shearing is easily accomplished.

Another feature is the smoothly operating jaw-type clutch, with all wearing parts accurately machined from tool steel and hardened. For safety and convenience, a non-repeat unit can be set to stop shearing action after each stroke.

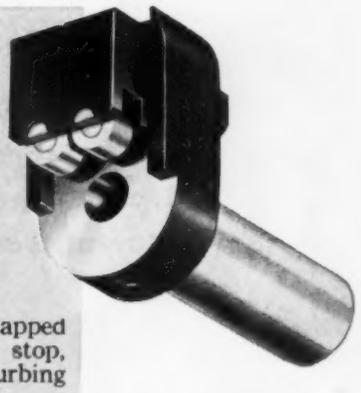
Take time now to write for full information about the complete Wysong and Miles line of power squaring shears and other sheet metal machines. **WYSONG AND MILES COMPANY, 623 FULTON STREET, GREENSBORO, NORTH CAROLINA.**

# TWO *New* SCREW MACHINE TOOLS

## MODEL AT
### Non-Releasing Adjustable TAP HOLDER

Correct alignment of taps between turret and work spindle is quickly possible with this new Tool. Simply set and tighten two screws. Permits adjustment of as much as 1/16" for any misalignment in machine. Moving parts enclosed. Smooth running and long wearing. In 3 Sizes.

## MODEL RR
### ROLLER REST



A Tool to replace the old fashioned solid support. Eliminates marring of piece parts and wear that causes variation in diameters. Adjustable rollers permit closer tolerances over long runs. Shank is tapped to permit adjustment of stop, drill or reamer without disturbing set-up of tool. In 2 Sizes.

# BOYAR-SCHULTZ

## SCREW MACHINE TOOLS for Full Time Production of Quality Piece Parts

Your screw machines are geared to maximum production only when equipped with Screw Machine Tools that can bring out FULL production possibilities. And FULL production also includes accuracy that insures a minimum of rejects.

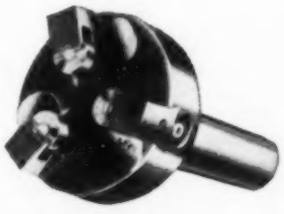
It is with this in mind that all Boyar-Schultz Screw Machine Tools are designed. They are made from the finest materials with expert workmanship and incorporate many outstanding features that assure high precision production.

**Model K Knurling Tool**

Designed to operate from the turret for difficult knurling operations behind and between shoulders. In 3 Sizes.

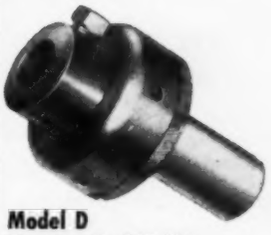
**Model DRH Adjustable Drill and Reamer Holder**

A precision made Tool designed for easy adjustment and saving in set-up time. Resists strains and impact. In 3 Sizes.



**Model C Burnishing Tool**

For producing a finish smoother than the usual machined surface. In 3 Sizes.



**Model D Floating Tool Holder**

For very accurate reaming. Full floating feature corrects misalignment that so often occurs between tool and work. Made in 8 Sizes.

**Model G Universal Tool Bit Grinding Fixture**

For grinding screw machine tool bits with precision exactness. Any particular grind can be duplicated singly or in quantity.

**Model RS Revolving Stop**

Quality made with a free turning head. Gives greater uniformity in piece part lengths. Prevents marring of parts. In 3 Sizes and 7 lengths.

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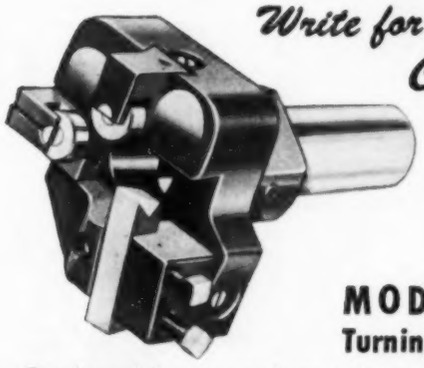
*Write for Complete Catalog*



**MODEL T Turning Tool**

Designed for very close tolerance work and made with built-in strength that holds adjustments through long runs. In 7 Sizes.

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**YOUR ZINC DIE CAST PRODUCTS**
**lasting corrosion protection**
**...better paint adherence...**
**colorful, *salable* finishes**

By a simple quick dip, manually or in automatic machines, Iridite provides a triple-purpose finish on zinc die cast products—Iridite gives you—

***CORROSION RESISTANCE...*** for protection from air, water, gasoline, other harmful corrosives.

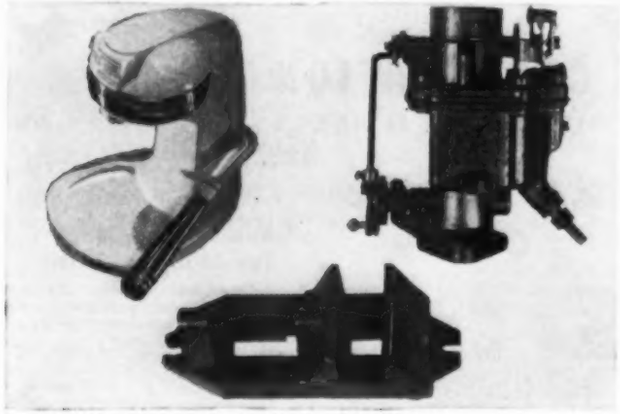
***PAINT ADHERENCE...*** to vastly increase corrosion resistance and to secure a paint system that defies chipping, flaking, peeling

***EYE APPEALING COLOR...*** that protects the product on the shelf, draws the customer's eye.

Iridite is a non-electrolytic chemical process, used and approved by leading manufacturers. If your products use zinc die cast parts, write today for information on how Iridite can help you make a better, more salable product.

*JUICER — Fruit juicer, finished with Iridite to insure permanent adherence of sparkling enamel finish.*

*CARBURETOR — Automobile carburetor, finished with Iridite for protection against corrosion from gasoline, fuel line moisture.*



*VISE—Bench vise, finished with Iridite to provide permanent blacking and corrosion protection.*

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**"ROCKWELL"** *Superficial* **HARDNESS TESTER**

**—for ALL-PURPOSE and for**

## *SPECIAL Hardness Testing*

Where surfaces are smooth and materials homogeneous, tests made by the "ROCKWELL" Superficial Hardness Tester are as representative of the hardness as those made on the regular "ROCKWELL"—even though the depth of indentation is only .005" or less. This extremely shallow indentation makes possible the testing of very thin material, nitrided or lightly carburized steel or areas too small for a regular "ROCKWELL" test. This wide range of use accounts for the trend to the "ROCKWELL" Superficial Hardness Tester—*made only by Wilson.*

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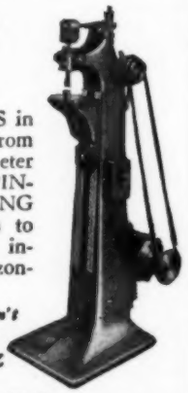
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

*Write for literature and don't forget to send samples.*



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

COMMON SENSE ASSEMBLY ENGINEERING

THE SIMPLER **P-K** FASTENING METHOD

# Spots a Saving of 1¢ per Unit

When the **See-Mor Lamp Co.** tried to fasten their Sealed Beam Headlight Adapters to the lamps with machine screws, rejects piled up because screws stripped out of the sheet metal, and tap breakage also became a serious problem.

They soon found that the P-K "common sense" method was simpler, faster and cheaper. After switching to P-K Type "Z" Self-tapping Screws, they reported assembly savings of $1.72 on every thousand screws driven, or 1¢ per lamp . . . a substantial percentage of the total fastening cost. And in addition the P-K Screws had the desired holding power in the thin metal.

Why not "spot" similar savings in your plant? There's no profit in running up needless assembly costs with tapping, riveting, nut running, or inserts in plastics that slow up molding, if you can use the simpler P-K fastening method. Often, P-K Screws allow improvements in product design as well as savings in assembly costs.

Ask a P-K Assembly Engineer to examine your assembly. In 7 out of 10 cases he can demonstrate that P-K Self-tapping Screws will save up to 50% in work-hours. If you prefer, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

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**PARKER-KALON SELF-TAPPING SCREWS**

**PARKER-KALON PRODUCTS** COLD-FORGED SOCKET SCREWS, WING NUTS, THUMB SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS
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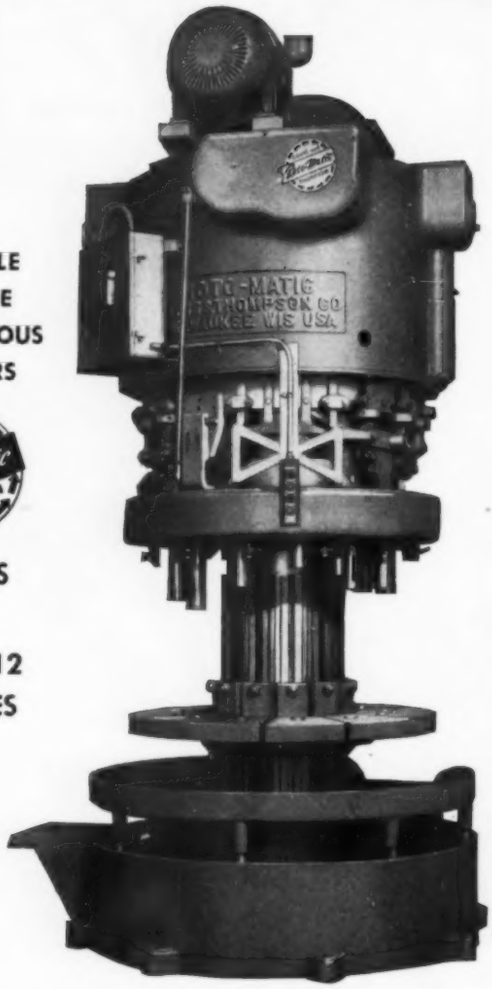
MULTIPLE SPINDLE CONTINUOUS DRILLERS



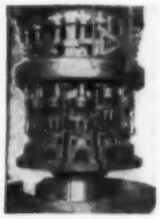

DAVIS and Roto-Matic THOMPSON

3 SIZES

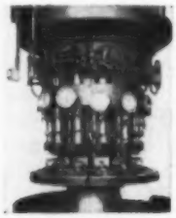
6-8 OR 12 SPINDLES

One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE DRILL HEADS



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AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

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# PUMP UNITS

*Use these compact self-contained units as*

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**SAVES TIME by ELIMINATING**

1. Machine stopping and starting
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*Dresser Compensated For Wear Easily Attached*

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**For Surface and Cylindrical Grinders**

• *Sent on 5-Day Approval at No Cost to You*

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Sleeve Bearings are free from complication. Requiring no shaft shoulders, no threaded shaft, no locknuts, they present the ultimate in straightforward trouble-free design. The Bunting Cast Bronze Sleeve Bearing is the popular leader in its field. Consult the Bunting Engineers. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

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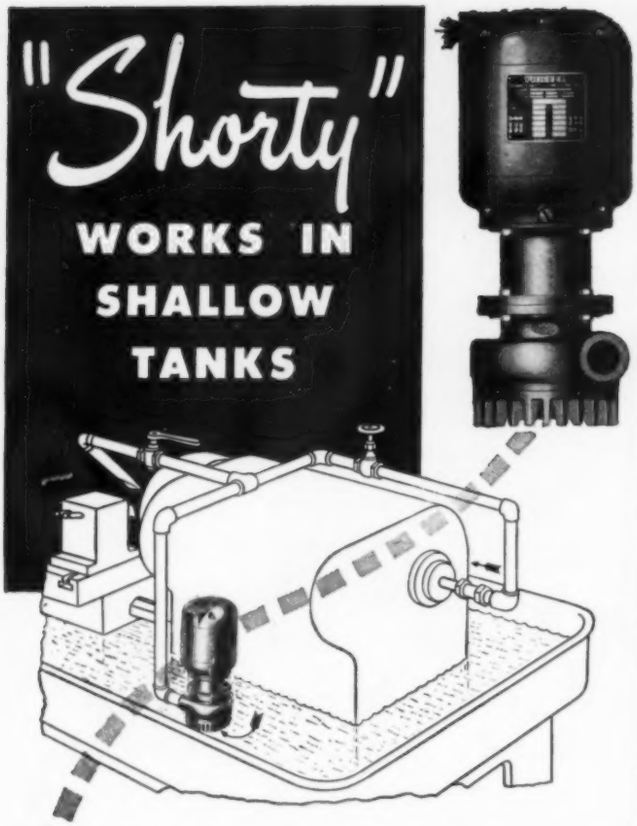

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*Designed for Shallow Chip Pans Without Covers*

Here is a performer with nine lives . . . it will give years of service . . . easily and quickly installed either with new equipment or as replacements . . . the inlet grille serves as a base, allowing the pump to rest directly on the bottom of the tank . . . clamps and holding brackets are not required.

400 STANDARD MODELS To Choose From

Pioneer Pumps in Seal-type, Seal-less and Railway designs for pumping coolants, cutting fluids, abrasive liquids, lubricants and water available in every type and size. Please describe your installation when writing for information.

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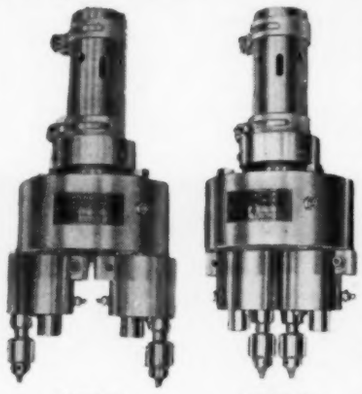
THE ERRINGTON

Adjustable Drilling Head



Extended Contracted

This versatile tool permits you to take advantage of a wide range of adjustment — without overhang — as illustrated by the contracted and extended settings. ERRINGTON Adjustable Drilling Heads can also be supplied with three spindles for equal adjustment in line and three, four, five or six spindles for equal adjustment on bolt circles. Range from 0 to 1½" drills.

*FEATURES:* Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case. All parts fully enclosed for pressure lubrication and protection. Non-slip positive clamping on all adjusting members.

***Send blueprint, sketch or sample for quotation— no obligation.***

Established 1891

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For Machinists, Toolmakers, Diemakers, Model Makers, Template Makers and Layout Men—also for general machine shop and toolroom use on tools, dies, jigs and fixtures and machine surfaces, this Layout Fluid has a considerable advantage over the old copper sulphate method.

With the use of this Layout Fluid, you simply wipe the surface clean and brush it on. It dries instantly.

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DAYTON ROGERS MFG. CO.

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ANOTHER *Plus* FEATURE

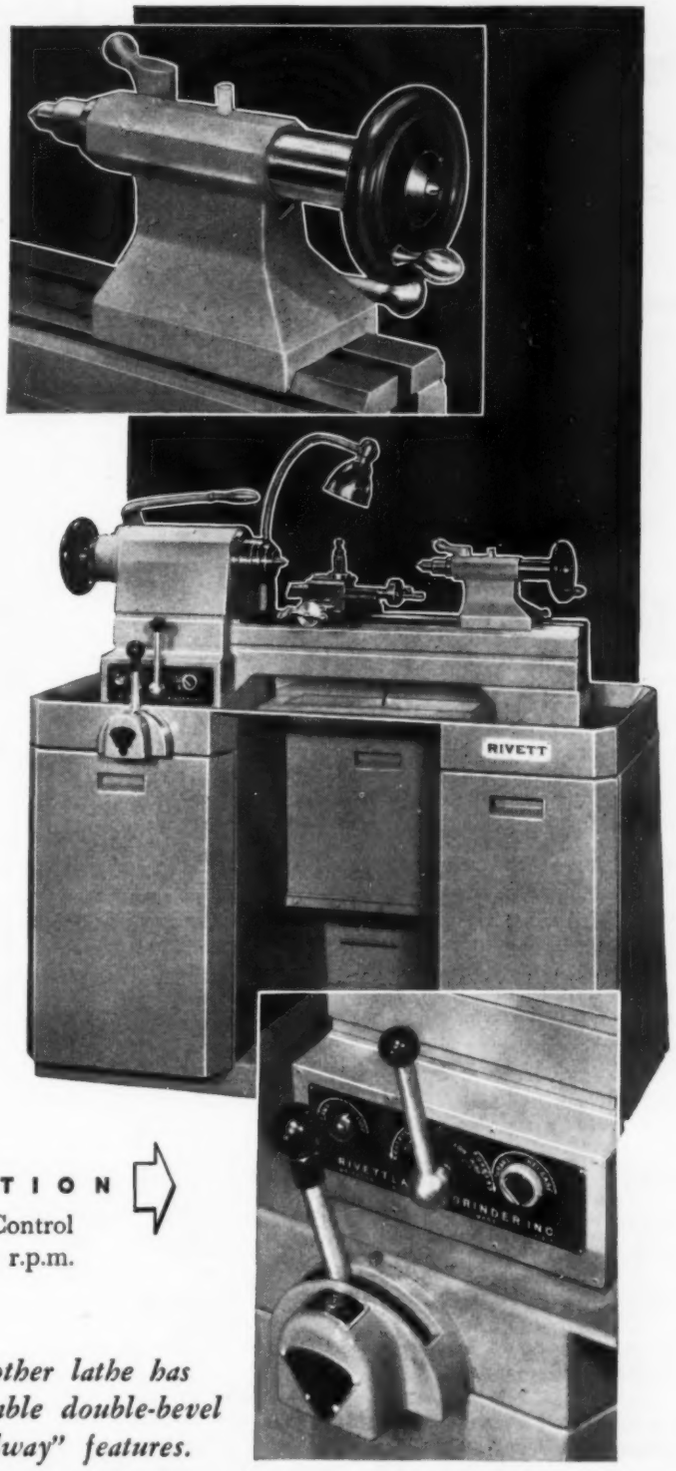
# THE *New* RIVETT 918 "STEELWAY" CABINET LATHE

## DOUBLE-BEVEL WAYS AND MAXIMUM BEARING AREA!

See the hardened and precision-ground steel bed with double-bevel ways for alignment. In combination with the wide top surface they provide maximum bearing area for slide rest shoe and tailstock. The self-centering action of the double-bevel ways safeguards tailstock from wearing away from cutting tool out of alignment.

Double-bevel ways assure against the inherent weakness of any type of bed which depends upon front bearing only for alignment. In such construction wear is lateral against a narrow bearing area and away from cutting tool which makes for taper turning between centers. This out of alignment also produces off-center (oversize) drilling and reaming.

On double-bevel ways the tailstock may be operated in conventional fashion, slid at will along the bedways and locked in desired position by slight finger touch on the eccentric binder. Binding force is self-centering and downward against a large bearing area.




**SPINDLE SPEED SELECTION**

Correct spindle speed for any operation. Control lever affords any speed from 90 to 3700 r.p.m. Selected speed shows on dial.

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*No other lathe has comparable double-bevel "steelway" features.*

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**FOR STEEL USERS**

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RIGHT NOW we can supply your needs completely for No. 2B Finish Sheets. These Sheets have been service-proved for excellence. Also for No. 4 Finish Sheets, which are noted for their uniformly high quality; Bars that meet high standards of machinability; Plates in sizes up to 120" wide and 360" long; Tubing—welded and seamless; Pipe, Angles, Channels, and Welding Electrodes in all standard grades and specifications.

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UNITED STATES STEEL

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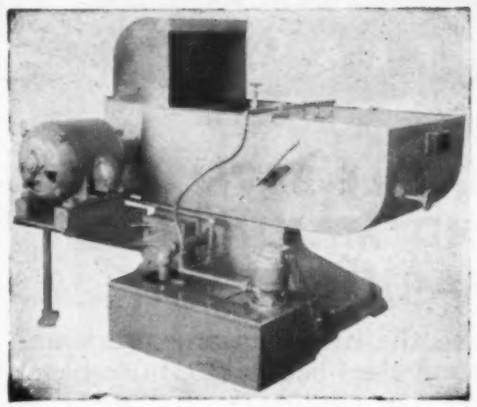

*. . . for higher production, greater accuracy and reduced cost*

High surface speeds, gravity and coolant are combined in the 20" Peerless to achieve higher production in a machine which will handle large parts with less effort on the part of the operator. It is heat-resisting for the flat surfacing of any material that can be surfaced on a belt surfacer. A working surface of 20"x30" makes it possible to oscillate large parts thereby insuring against time ordinarily lost in changing belts.

Made also in a 14" size.

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*Production* MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

SHELDON L-44 10⅛" SWING

ACTUAL SIZE OF HOLE THRU SPINDLE

***Large enough for most work. . . . Small enough to do it profitably!***

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Built in a modern machine tool plant that is equipped with the latest lathe building equipment, they are moderate in price, hence pay out in a very short time.

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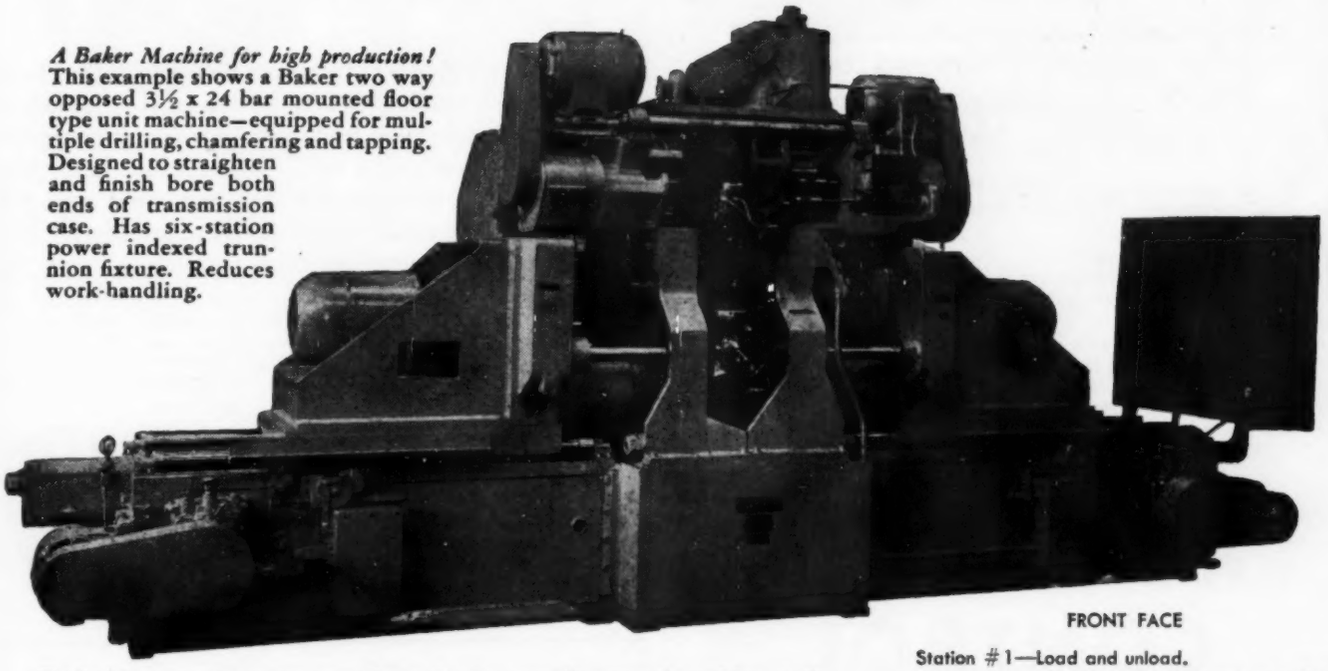
# BAKER Multi-Operation

## ★Two Way MACHINE

*A Baker Machine for high production!* This example shows a Baker two way opposed 3½ x 24 bar mounted floor type unit machine—equipped for multiple drilling, chamfering and tapping. Designed to straighten and finish bore both ends of transmission case. Has six-station power indexed trunnion fixture. Reduces work-handling.



Backed by over 70 years experience in the manufacture of machine tools; Baker Machines are engineered to offer greater production and improved accuracy by combining operations and reducing work handling. Baker units are highly flexible . . . can be adapted to a wide range of operations including single or multiple spindle drilling, boring, reaming, counterboring, hollow milling and chamfering. Send us details about your job problem. We'll be glad to show how a Baker machine will help you beat rising costs with an upswing in productivity.

**FRONT FACE**

Station #1—Load and unload.
Station #2—Bore 1.925" one inner hole "D"
—Bore 5.188 & C.B. 5.595 one hole "C".
Station #3—Bore 1.950" one inner hole "D"
—C.B. 5.625" one hole "C".
Station #4—Drill .4219"—Four holes "A".
Drill .261" and C.B. .508" one hole "B".
Drill .261" one hole "E".
Station #5—Chamfer with .5625" drill—Four holes "A".
Chamfer with .375" drill—Two holes "B" and "E".
Station #6—Tap ½"—13—Four holes "A".
Tap 5/16"—18—Two holes "B" and "E".

**REAR FACE**

Station #1—Load and unload.
Station #2—Bore 6.740" one hole "G".
Station #3—Drill .375" and Chamfer .4687" one hole "F".
Station #4—.316" drill—Five holes "H".
.328" drill—One hole "F".
Station #5—Chamfer with .375" drill—Five holes "H".
Ream .390" and .343"—One hole "F".
Station #6—Tap 3/8"—16—Five holes "H".
Tap 7/16"—20—One hole "F".

**BAKER BROTHERS, Inc., Toledo, Ohio**

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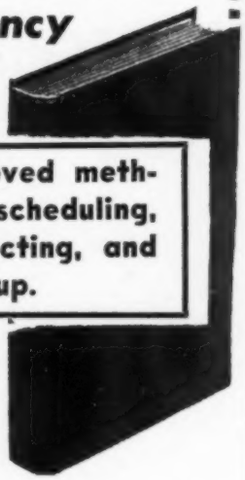
# How to . . . PLAN and CONTROL production—*for greater speed and efficiency*



**Tested and improved methods of routing, scheduling, dispatching, inspecting, and following-up.**

HERE'S a book that shows you how to get greater volume at lower cost with successful methods of production planning and control. It helps you handle your problems of routing, scheduling, dispatching, inspecting, and following-up . . . it reflects current factory methods in more than 185 representative companies in all types of industries.

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## By L. L. Bethel, W. L. Tann, F. S. Atwater and E. E. Rung

***284 pages, illustrated, $3.50***

This guide brings you the principles behind improved control systems . . . hundreds of techniques and actual industrial cases. Operation analysis . . . budgeting costs . . . preparing a master schedule . . . translating orders into production . . . following-up . . . inspection . . . record keeping . . . **these and scores of other planning and control methods are analyzed and evaluated.**

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Forecasting of sales and production volume • control of inventories and costs • methods of classification and identification • master route cards • keeping stores records • what "control" means to the plant organization • and methods of expense distribution. Put this handy volume to work for you on your production line—to help locate problem-areas and develop a sound system of controls for your plant.

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7. Routing of Operations and Processes
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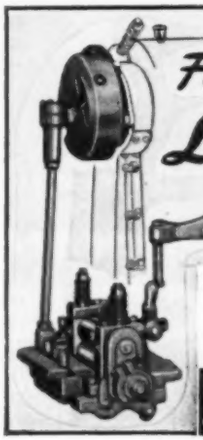

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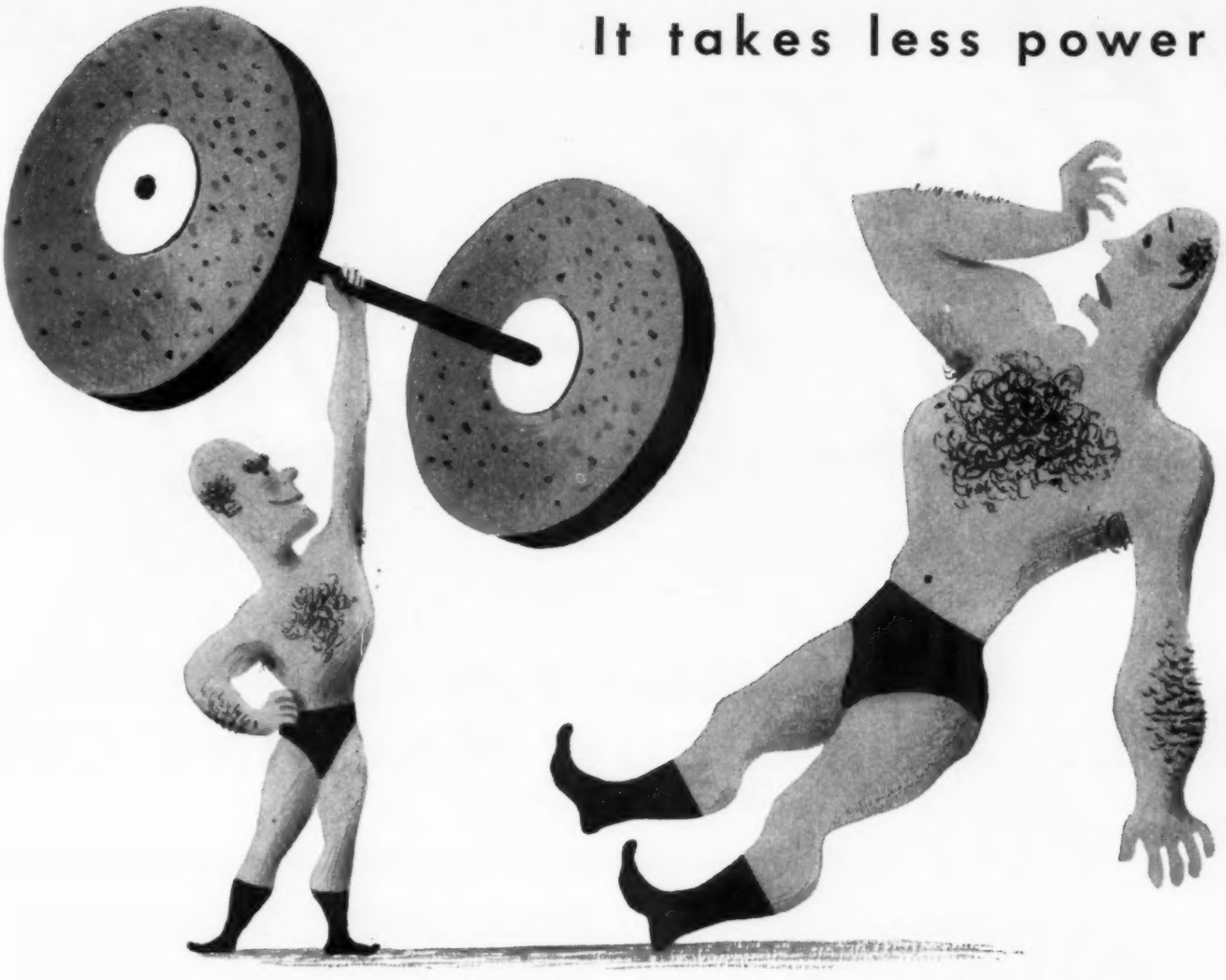

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Yes, conventional wheels will do the work . . . if you push them to the limit, allow twice as much grinding time, discount wheel wear and omit power consumption in figuring your overhead.

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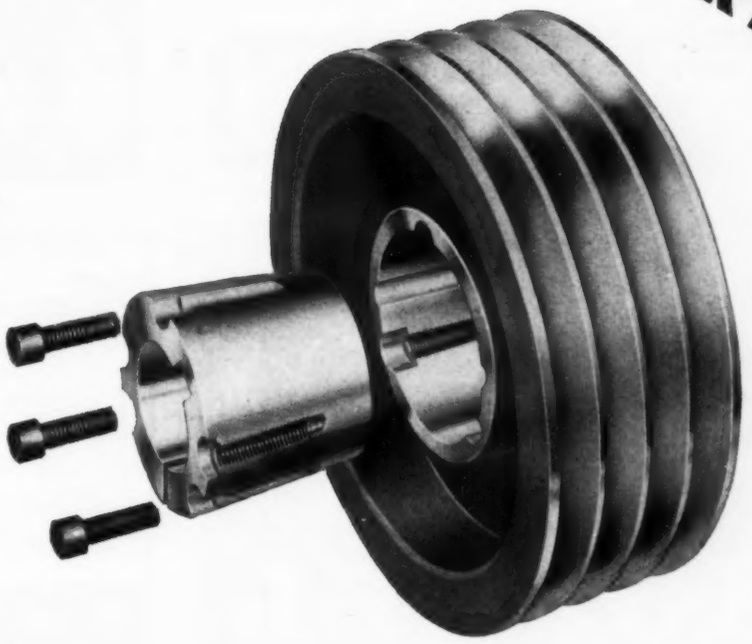

A complete unit—in a complete range of sizes in Dual Duty (A and B); B, C, and D grooves. Write us for detailed bulletin, A175C, on this new and different taper bore sheave.

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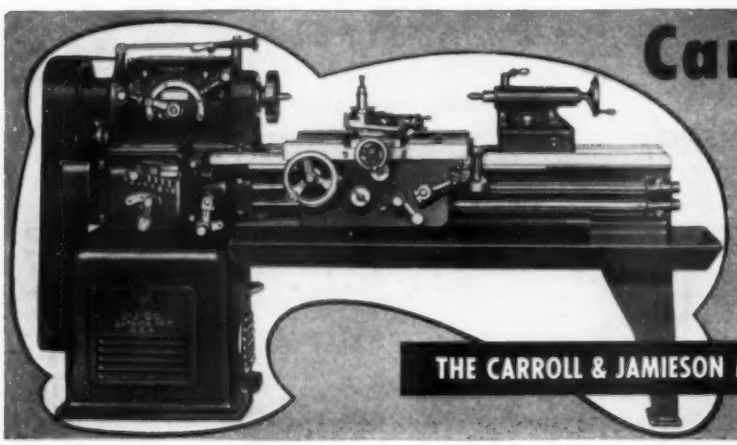

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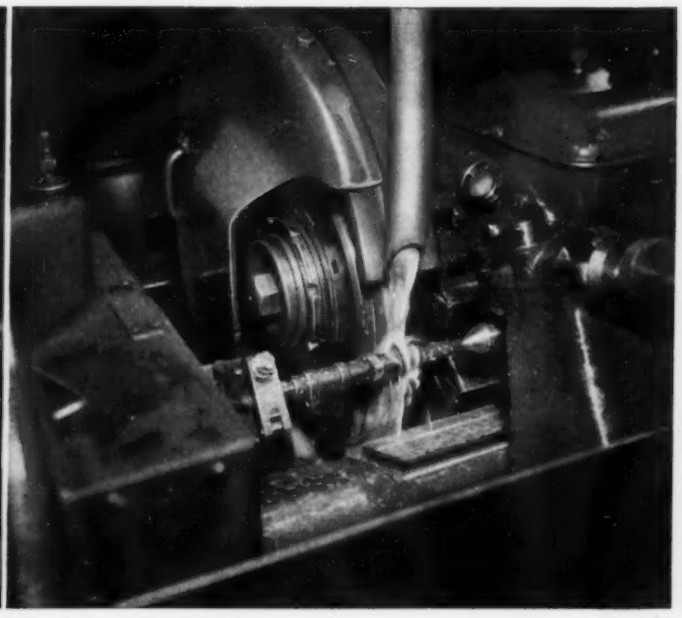
*Cities Service cutting oil specialists have helped make turret lathe production more profitable for many of our customers*



*In cam lobes grinding as in other grinding operations Cities Service Soluble fluids make fine finish possible with fewer rejects.*

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Why not find out what the right type cutting fluid will do for you?

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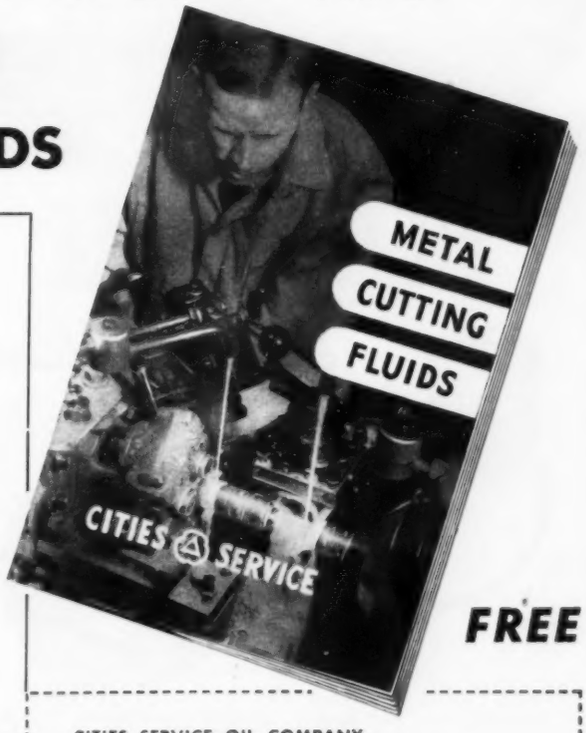


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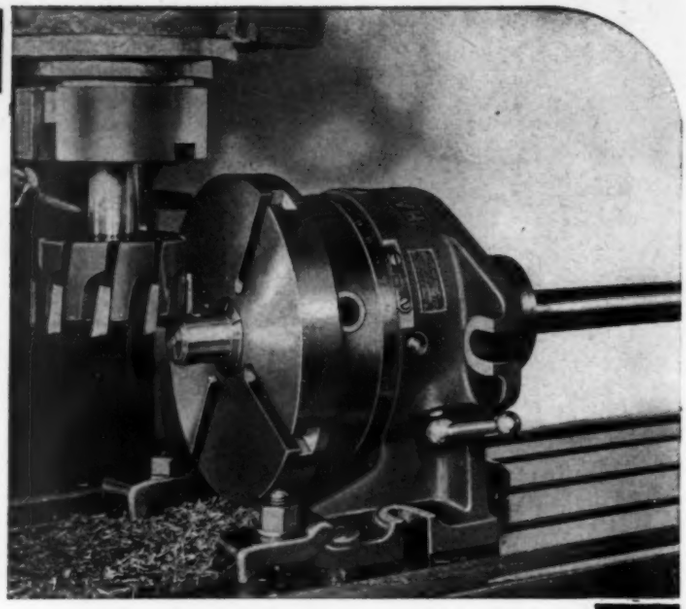
The uses of the Super-Spacer in horizontal and vertical milling operations are unlimited. Here the Super-Spacer, mounted with a face plate and draw-in collet combination, shows its adaptability for milling bar stock. Investigate your present milling methods and see if your shop can't profit by the speed and accuracy of the Super-Spacer. For complete details write Dept. S2.



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*Steel Collars*

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Pats. Pend.

"Hallowell" Solid Steel Collars, functionally proportioned throughout, are precision-machined so faces run perfectly true . . . are also highly polished all over . . . yet they cost less than common cast iron collars; 3" bore and smaller are made from Solid Bar Stock and fitted with the famous "Unbrako" Knurled Point Self-Locking Socket Set Screw . . . a set screw that, once tightened, holds and stays tight to make sure the collar won't shift on the shaft. "Hallowell" . . . a "buy word" in shaft collars . . . available in a full range of sizes for

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This ...may be just the cleaner you need

OAKITE Composition No. 97 is a new emulsifiable solvent cleaner that dilutes with water for use in spray-washing machines.

Oakite Composition No. 97 removes buffing compounds, drawing and stamping compounds, cutting and grinding lubricants, rust preventives, metal chips and other dirt from steel, cast iron, brass, aluminum and zinc.

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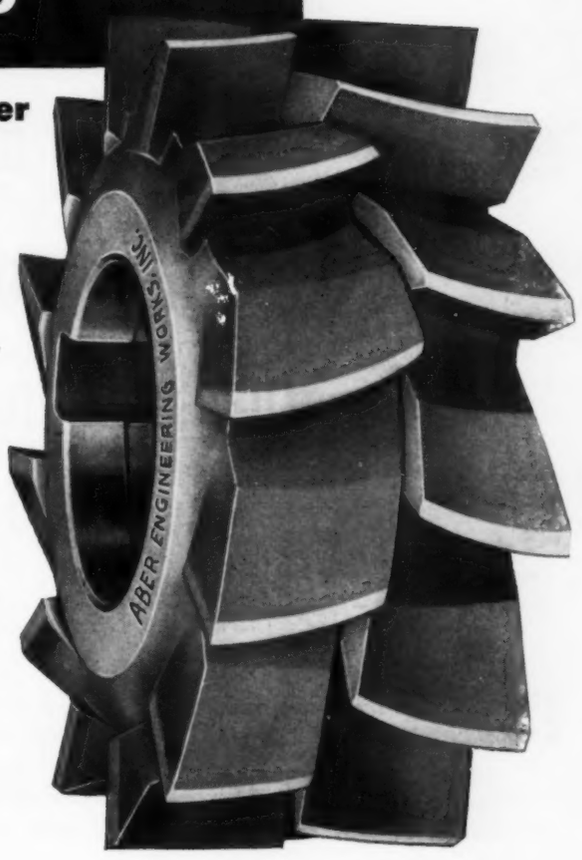
# OVER 20,000
## and Still Going Strong

**...With An Aber Curved Tooth Milling Cutter**




### Objectional chatter marks from standard type cutters surprisingly resulted in increasing production from 4,000 to 20,000 pieces per grind

Eight months ago a manufacturer experienced difficulty in obtaining a smooth surface on a side milling operation while using standard type cutters.

Aber "Curved Tooth" right and left hand shear side milling cutters were recommended to eliminate chatter marks. NO THOUGHT WAS GIVEN TO INCREASING PRODUCTION.

The results proved outstanding — After eight months of continuous operation, without once removing the cutters from the machine, Aber "Curved Tooth" cutters produced 20,000 pieces against previous peak outputs ranging between 3,000 and 4,000. In addition the cutters are still producing pieces within specified tolerances and with a finish finer than that obtainable with NEW standard type cutters.

*Here Are the Facts*

**OPERATION DATA**

**MACHINE:** U. S. Multimiller

**TOOL:** Aber "Curved Tooth" right and left hand shear side milling cutter. 3"x ⅝"x1¼"

**MATERIAL:** Bronze Turbine Blades.

**COMPARATIVE PERFORMANCE**

| | ABER CUTTER | STANDARD CUTTERS |
|---|---|---|
| S.F.M. Speed: | 400sfm | 400sfm |
| Feed per Rev.: | 16" per min. | 12" per min. |
| Depth of Cut: | ⅛" | ⅛" |
| Pieces per Grind: | 20,000 and still going strong | 3,000 to 4,000 maximum |

You too can profit by applying Aber "Curved Tooth" milling cutters for increased production and reduced rejections due to off-tolerance, unsatisfactory finish milling operations. Remember every Aber Tool has the exclusive, patented "Curved Tooth" design providing chatterless, smooth cutting action.

**ABER**

**ENGINEERING WORKS INC.**
WATERFORD, WISCONSIN

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your job.*

# You know more about advertising than you think !

IF YOU UNDERSTAND the basic principles of mass production —

If you're on familiar ground when it comes to time-motion studies, obsolescence curves, and assembly-line techniques —

If you regard every operation in your plant as a challenge to further reduce your manufacturing cost-per-unit —

Then you know a lot more about advertising than you think. Yes, *advertising!*

For basically, advertising is the application of assembly-line techniques to the *manufacture of a sale.* And how are sales manufactured? Like any other commodity, by sequence of "processing operations." In this case they include —

1. Seeking out prospects
2. Arousing their interest
3. Creating a preference for your product
4. Making a specific proposal
5. Closing the order

Couldn't your salesmen handle this entire sequence? Certainly — if you had *enough* salesmen, and weren't concerned about the cost. But no salesman should *have* to spend his valuable time on missionary work. Not when those first three steps can be *mechanized* for him — not when they can be handled so much more economically — through the efficient use of business paper advertising.

Why *business* papers? Because nowhere does your advertising work more efficiently than in the business publications which reach your best prospects. Nowhere else can "mechanized selling" contribute so much toward reducing the cost of manufacturing a sale!

**American Machinist**

*is a member of The Associated Business Papers, who have published an interesting folder entitled, "10 ways to measure advertising effectiveness." We'll be glad to send you a copy. And if you'd like reprints of this advertisement (or the entire series) to pass along to others in your organization, just say the word.*

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**Builders of Special Machines a Specialty. Facilities Available for Production. Quantities of Small and Medium Precision Parts.**

*Equipment List on Request*

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*ACCURATE WORK QUICK SERVICE*

*Send Blue Prints for Free Estimates.*

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AMERICAN MACHINIST

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**SUB-CONTRACT**

Kansas City welding machinery and metal parts manufacturer with insufficient volume to demand full use of available plant machinery and floor space, desires to utilize facilities through sub-contracting assembly work from eastern or western states manufacturer now shipping finished assemblies into the midwest area.

Also have complete facilities for unit fabrication.

*Please direct inquiries, or send drawings and full information to*

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**Designers & Manufacturers of Tools & Machinery**

Special machine work; facilities available for production quantities of small, medium and large machined parts, assemblies and fabrications. Specializing in stainless steel aviation gas turbine parts.

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Facilities available for production manufacturing of small precision parts; building and assembling special machines, small tools, jigs, fixtures, etc. Experience in special alloys such as Stainless Steel, Hastelloy, Ni-Resist, etc. *Inquiries Welcomed.*

*Equipment List Sent on Request*


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*SAN FRANCISCO: 68 Post St. (4)*

## POSITIONS VACANT

MECHANICAL ENGINEER—Opening in Chattanooga. Should have at least two years experience in design and drafting, and be capable of checking drawings for accuracy. Opportunity offered for developing into Product Engineer. Write full details of qualifications and enclose photos, (Non-returnable). P-6504, American Machinist.

ENGINEERS: LARGE College offers $3000, approx. half time teaching-studying. All ranks univ. positions, experienced $4500-$6500 nine months. Give phone, photo, qualifications. Cline Teachers Agency, East Lansing, Mich.

WE HAVE an opening for a machine tool designer who has had extensive experience preferably in designing large machine tools. For a capable man this is a good opportunity. Give full information regarding age, salary and experience. Replies will be treated as strictly confidential. P-6895, American Machinist.

## SELLING OPPORTUNITY OFFERED

SALES ENGINEER wanted for permanent position with old established and successful company building high grade machine tools. Good opportunity for capable experienced Sales Engineer. Plant is modern and company progressive, has highest financial rating and is leader in its field. Located in attractive residential section of upper New York state. Applications will be treated as confidential and should give particulars as to experience, age, references, etc. SW-6910, American Machinist.

## EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service 38 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

## POSITIONS WANTED

CHIEF ENGINEER or assistant position. Twenty years experience in all matters pertaining to the design and development of industrial and consumer products. Thorough knowledge of manufacturing methods. Wide experience in originating and developing successful new products, modernizing existing lines and supervising detailing for practical mass production. Electric appliances, power tools, mechanical and electrical devices. College graduate, age 45. PW-6502, American Machinist.

PRODUCTION EXECUTIVE: Metal stampings; screw machine products; castings. High speed progressive die, and deep drawn stampings. Parts assembly. Lacquered; painted, and plated finishes. Unusual ability to handle labor. PW-6615, American Machinist.

DO YOU Need Steel? Former mill representative familiar with sources of steel supply and fabricated products, wishes position with manufacturer. Can aid in procuring materials, and sales. Salary arrangement. PW-7010, American Machinist.

MACHINE-SHOP Supt. Background. 20 years experience—medium to medium heavy machinery. Charge of mfg. and assembly, also labor relations. Good record. Reliable. Efficient. Desires position with small or medium size company. PW-6994, American Machinist.

## SELLING OPPORTUNITY WANTED

MANUFACTURERS AGENT—well established in Southwestern Ohio (Columbus, Springfield, Dayton, Cincinnati) can now give time to an additional item of cutting tools, raw material or manufactured parts. Your investigation invited. RA-6855, American Machinist.

## PATENT ATTORNEY

**Patent Practice**

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel Registered Patent Attorneys. Suite 453, 815-15th Street, N. W. Washington 5, D. C.


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**New "SEARCHLIGHT" Advertisements**

received by 10 A. M. Monday, Nov. 15th, will appear in the December 2nd issue, subject to space limitations.

*Classified Advertising Division*

**AMERICAN MACHINIST**

**330 W. 42nd St., New York 18, N. Y.**

# EMERMAN OFFERS FROM STOCK

**#24 GLEASON STRAIGHT BEVEL GEAR GENERATOR.**

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**FOR ROUGHING ONLY**

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**35" PITCH DIA.—1½ D.P. PUSH BUTTON CONTROL WITH ALL ELECTRICAL EQUIP.**

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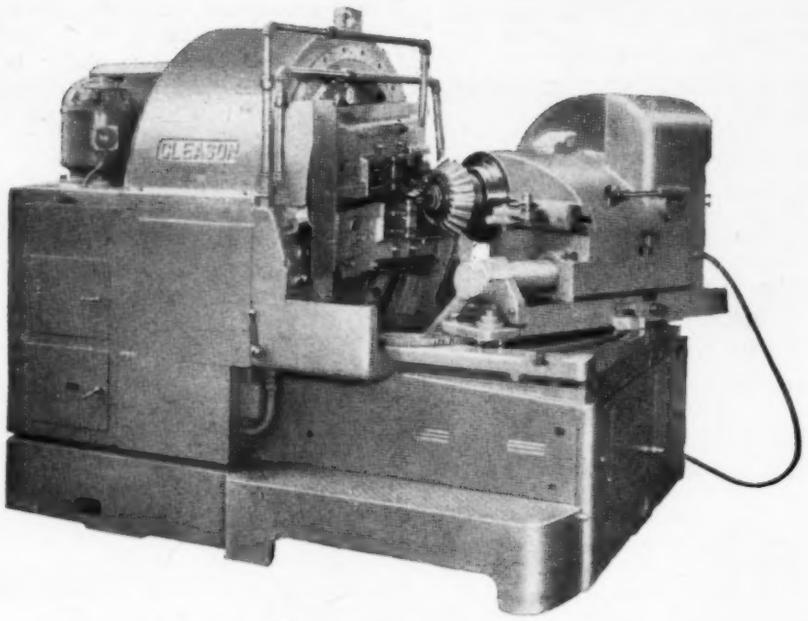
***EXCELLENT CONDITION***




**EMERMAN MACHINERY CORP.**

875 W. 120th St.
Chicago 43, Ill.

## *NEW— SURPLUS*

**TUNGSTEN CARBIDE TIPPED SIDE MILLING CUTTERS**

| | |
|---|---|
| 3" x ¼" x 1" | $ 8.13 |
| 3" x 5/16" x 1" | 8.13 |
| 3" x ⅜" x 1" | 8.13 |
| 3" x ½" x 1" | 8.13 |
| 4" x 5/16" x 1" | 12.50 |
| 4" x ⅜" x 1" | 12.50 |
| 4" x ½" x 1" | 12.50 |
| 4" x 9/16" x 1" | 12.50 |
| 4" x ⅝" x 1" | 12.50 |
| 4" x ¾" x 1" | 12.50 |
| 5" x ½" x 1" or 1¼" | 15.63 |
| 5" x 9/16" x 1" or 1¼" | 15.63 |
| 5" x ⅝" x 1" or 1¼" | 15.63 |
| 5" x ¾" x 1" or 1¼" | 15.63 |
| 6" x ½" x 1" or 1¼" | 18.75 |
| 6" x ⅝" x 1" or 1¼" | 18.75 |
| 6" x ¾" x 1" or 1¼" | 18.75 |
| 8" x ¾" x 1" or 1¼" | 25.00 |
| 8" x 1" x 1" or 1¼" | 25.00 |

**VICTOR MACHINERY EXCHANGE, INC.**
251 Centre St., New York 13, N. Y.
CAnal 6-5575

## UNUSUAL VALUES

**Milling Machines**—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

**Drills**—Large selection, single and multiple spindles also bench types, many of them new.

**Gear Cutters**—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

**Grinders**—Cylindrical B & S No. 11, Planer type 16"x36", Surface 12"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

**Lathes**—14"x6', 8', 10—16"x6', 8', 10'—18"6', 8', 10'—20"16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized
Large stock 19" and 18" bench and floor type.

**Planers**—Single head 24"x6', 24"x8', 26"x8'.

**Shapers**—16", 20", 24", B.G. crank.

**Turret Lathes**—J & L 2"x24"—3'x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

**SPECIAL**—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

**WOOD WORKING MACHINERY**—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

**Drill**—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel, motor attached.

**PATTERN MAKING MACHINERY**—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

**THE OSBORNE & SEXTON MACHINERY CO.**
P. O. Box 88, Columbus 16, Ohio

## BARGAINS!

**SURPLUS EQUIPMENT**

AJAX 1½", 3½", Upsetter, M.D.
AMERICAN 5' Radial Drill, Motor Drive
BIRDSBORO 325 ton Vertical Press, Hyd. New 1942
BRIDGEFORD 36x24' Centers Engine Lathe, M.D.
BRYANT 16-CP-16 Internal Grinder, New 1941
BULLARD 16" 6 and 8 spindle Mult-au-matic Type D Single indexing, New 1943
CINCINNATI #3 Centerless Grinder, M.D.
CINCINNATI 3, 4, Vertical Miller—geared, M.D.
CLEARING 50 ton Hyd. Press—New 1940
CRANES from 5 to 30 ton capacity all 230 volts, DC current
FRANKLIN 4¼" bar Horizontal Boring Mill, Table Type, M.D.
JONES & LAMSON "Fay" 20x25 Centers Production Lathe, New 1941
LeSWING 8x108" Centers Prod. Lathe, New 1941
NATIONAL ACME 9/10"—5 spindle, Model C ASM, Motor Drive

NIAGARA 1000, 1200 KVA Transformers, New 1941

NILES 30x50' Bed Boring Lathe, New 1941
NILES 72x63' Centers, Comb Boring and Turning Lathe, M.D.
NILES 48"x48"x16' Planer, A.C., M.D.
NILES 200 Ton Wheel Press, Motor Drive
NILES 5" bar, Floor Type, Horizontal Boring Mill
NILES 100" Vertical Boring Mill, 2 swivel heads, M.D.
PUTNAM 42"x25' Centers Engine Lathe, M.D.
SCHUMACHER & BOYE 24"x158" Centers, Geared, M.D.
SUNDSTRAND #3A Duplex Miller — 40" feed, Production Lathe, New 1941
VAN NORMAN #3 Duplex Universal Miller

**TIMKEN BEARING**
CINCINNATI No. 4 Plain Milling Machine,
KEARNEY & TRECKER No. 4 Plain Miller
WARNER & SWASEY #5 Univ. Turret Lathe

This is a partial listing.

**HARRISON MACHINERY EXCHANGE, INC.**
South 4th St. Harrison, N. J.
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## MACHINERY COMPANY

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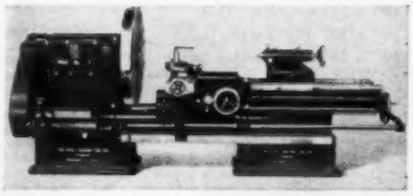


Nebel 20"-40"x8' Geared Head Quick Change Gear Extension Bed Gap Lathe. 3/60/220 volts motor driven. Taper Attachment, faceplates, chuck, tailstock, plus Hexagon Turret with power feed. Immediate delivery.

### ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20'x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
14"x8' Rockford, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
13"x5' South Bend Q.C.G. 30" centers
12"x30" American Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey Q.C.G. M. Drive
12"x5' Hendey Motorized. Taper & Collets.
12"x5' Sebastian Q.C.G. Grd. Hd.
12"x5' Mulliner Motorized. Taper Att.
12"x3' Craftsman, Bench, M. Drive
12"x18" Porter-Cable Carbo-Lathe
11"x4' Sidney, Q.C.G. Floor Type

### TURRET LATHES

Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity—3½x3/8x9
Niagara Initial Type. 12'x⅛" capacity.

### METAL ROUTERS

Onsrud Double Spindle Radial Arm #A2DD 108" Arms with frequency Converter for 3/60/220
Onsrud #W-255 Universal Heavy Duty Single Spindle Router, with all steel table 54"x36" with T-slotted edges.

Porter-Cable 12"x18" Mechanical CARBO-LATHE. Semi-Automatic. 63 spindle speeds, 95 to 1130 r.p.m. Collet capacity —1".

### GRINDING MACHINES

J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 30" Vertical Surface
Thompson Hydraulic Horiz. Surface
Abrasive Automatic Surface, 22x8
Reid #2 Automatic Surface, 6x18
Norton Hydraulic Horiz. 6x36
Heald #25 Rotary Surface
New Leach 6x12 Horiz. Surface, 3/60/220 volts
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Gorton Dble. End Disc, 18" dia. discs
Besley Dbl. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Cincinnati #2 Univ,. Cylindrical 6x36
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders

### AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff
#2 Brown & Sharpe High Speed Automatic. Turner Drive.
1—1¼" Cone 4-spindle Automatic M.D. Threading Spindle
Cleveland Model "A" 3¾" Single Spindle. Motor driven.

### PUNCH PRESSES

Caldwell 200 tons Horiz. Hydr. Wheel Press.
Ferracute #86 Wide Frame, motor driven. 6½" between housings. 1¾" stroke.
Ferracute No. EG52 Coining Press. 150 tons.
General Flexible Power Press. 8 tons, M. Dr.
Stiles O.B.I. 14 tons, 1½" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke, M. Dr.
Tompkins & Johnson Power Arbor Press.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Bliss #18, #20, #20B, O.B.I. Motorized

### SHEARS

Bliss #109 Slitter, 10 ga. cap.
Pexto #571 Slitter, 3/16" cap.
Wais & Roos 10' x ¼", 15' gap.
NEW Famco 36"x18 ga. Squaring
Pexto Foot squaring 30" x 22 ga.
Ohl 6' x 14 ga. Motor driven Squaring Shear. With gauges & extra blades. 3/60/220/440

Sutton #2 Straightening Machine. Cap. ¾" to 3½" tubes or solids. 50 h.p. 3/60/220 volts motor drive.

### BROACH

Oilgear, Horizontal Hydraulic Type #XA. Capacity —20,000#, 56" stroke. Motor driven. Coolant system and hydraulic system

### MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D.
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ames Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ., Horizontal
Cincinnati #3, #4, #5 Pl. Horiz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr.
Milwaukee #3K Vertical, M. Dr.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #2B Universal Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Van Norman #2 Duplex, Motorized
Cincinnati #0-8 Vertical, M. Dr.
Cincinnati #0-8 Plain Automatic
Cincinnati #0-8 Rise & Fall
Cincinnati #2-18 Plain Automatic

Cincinnati #5 Horizontal Hi Power Milling Machine. With rectangular overarm. All geared speeds & feeds. Single pulley drive. Range—50'x14"x21". Immediate Delivery, (1—Available.)

### SHAPERS & PLANERS

Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Potter & Johnston 16", Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
Shaper—American 24" crank, motorized
Shaper—Columbia 32" B.G. Crank. Gearbox
New Haven 12" Slotter, motorized
Planer—Whitcombe 24x24x6 motorized
Planer—Shaper—Niles-B. Pond 20x20x24
Planer—Betts 72x60x30 Modern 4-Head
Planer—Betts 72x60x25 Modern 4-Head
Planer—Betts 122x72x34 Modern 4-Head

### DRILLING MACHINES

American 8' Triple Purpose Radial, M. Dr.
Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Demco 4-Spindle Drill #2 M. T. M. Dr.
Fosdick 5" Arm 14" col. Radial
Natco #12, 20 Spdle. Multiple, 3/16" cap.
Fox #15, 54 Spdle. Multiple, #1 M.T.
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Canedy-Otto 21" Single Spdle. Late Type
Cinci-Bickford 21" Drilling & Tapping, #3 m.t.
Buffalo Forge #2MS Drill. Late Type
Barnes 22" Backgeared Upright Single Spdle.
Leland-Gifford #2MS, 2-Spindle Upright
Edlund #2B, 4-Spindle Upright, #2 m.t.
NEW Buffalo Forge #15, #18 Single Spdles.

Bradley 200# Rubber Cushioned Helve Hammer. Single pulley drive. 225 to 240 blows per minute. Stroke adjustable from 1" to 5½". Separate adjustable anvil. Total weight—10,200#. Price—$1850.00 net fob Rochester, N. Y.

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS ENGINEERED REBUILT

## FOR HEAVY TOOLS . . . . . SEE SIMMONS

### BORING MILLS

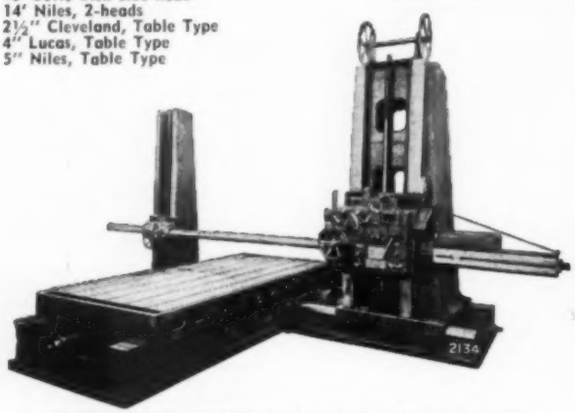
24"—36" and 42" New Era Bullard
36"-44" Niles Vertical Turret
42" & 52" King, 2-Heads
48" & 54" Colburn, 2-Heads
60" & 72" Niles, 2-Heads
61" Bullard Maxi Mill
84" Niles, 2-Heads
10' & 12' Niles, 2-Heads
10' Betts with side head
14' Niles, 2-heads
2½" Cleveland, Table Type
4" Lucas, Table Type
5" Niles, Table Type

56" x 30" x 20' Consolidated Heavy Guide Planer, with two adjustable housings, 4-rail heads.

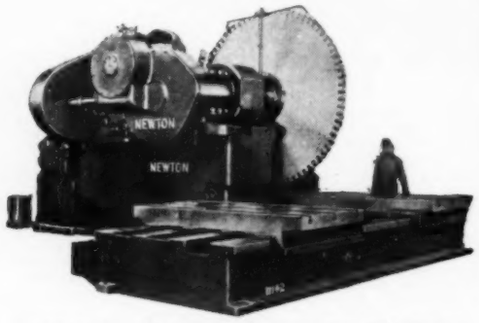
16' x 12' x 35' Niles Planer, Variable Voltage Drive 125 H.P., 220/440 volt, 3 phase, A.C.

### LATHES

16" & 18" American, G.H.
20" & 24" American, G.H.
30" x 10' American, G.H.
36" x 20' Lodge & Shipley
36" x 24' Niles Timesaver
42" x 18' American, G.H.
42" x 32' American, G.H.
48" x 18' American, G.H.
50" x 50" Pittsburgh, G.H.
60" x 28' Niles, G.H.



6" & 3½" Spindle JONES Late Type Boring, Drilling and Milling Machine. Planer table 7' 6" x 17'. Max. Table to 6" Spindle 8' 6", Approx. Weight 160,000#.




120" Newton Type "U" 97-A Heavy Duty Cold Saw with Hydraulic Screw Feed.

Write today for Complete Current Stock List of Simmons *Engineered-Rebuilt* Machine Tools.

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ENGINEERED Machine Tool REBUILDING

### *IMMEDIATELY AVAILABLE*

1—Bullard MultiAutomatic 16" 8 spindle, Double Indexing.
1—Cincinnati Centerless Grind. No. 2.
1—Hydrohone, Std. No. 200, Single Spindle.
1—Degreaser, w/Motor, Mod. 3D-650.
1—Natco Multi Drill, 14 spdl., No. E-5.
3—Reid Automatic Lathes No. 6 WSL, Grd. head with air operated collet.
1—Lincoln Automatic Welder, complete. Serial No. A-184-307.
1—Diamond Drill Grinder with collets.
2—Fostoria Evanray Infra-red ovens with lamps and control.
1—Kinny Vacuum Pump VSD-556.
1—Carrier No. 41B2 Air Conditioning Unit.
1—Surface Combustion LSO-12-18 oven furnace with carbofrax hearth (gas fired).
1—Surface Combustion SC, gas fired, circular pot furnace.
1—SC rated gas fired circular pot furn.
1—Ingersoll Rand Air Blower.
3—Brown Model 1001-820 Indicating Control Pyrometer.

*All these machines are in first-class condition and can be seen in operation at our plant.*

**WESTLAKE MANUFACTURING CORPORATION**
**Canastota, New York**

### STOCK TOOLS — *Prompt Shipment*

BORING MILL, Hor. #0 G & L, 3" bar.
BORING MILL, Vert. 14' Niles, 2 Hds., M.D.
BORING MILL, 42" King, 2 Hds., M.D.
BORING MILL, 72" N-B-P, 2 hds., M.D.
BROACH, XA Oilgear, Hor., 60" Str.
DRILL, Radial 4½' Cincinnati-Bickford.
DRILL, Radial 5' Cincinnati-Bickford.
DRILL, Radial 6' American, Mtr. on Arm.
GEAR HOBBERS, 12-H Gould & Eberhardt
GRINDER, Broach, "E" Thompson, 6x48" Hyd.
GRINDER, Int., No. 72-A-5 Heald, Hydraulic.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
HAMMER, Steam Drop, 2000# Chambersburg.
HAMMER, St. Forging, 6000# Chambersburg
LATHE, 9"x5' Hardinge, Prec., M.D.
LATHE, 14"x6' Hendey, Tie-Bar, T.A., M.D.
LATHE, 14"x6' L & S, 12-Speed Grd. Hd.
LATHE, 22"x16' L & S, Q.C.G., T.A.
LATHE, Turret, No. 3-A W & S, 4¾" h.s.
MILLERS, Pl. No. 3, 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
MILLER, Thread, No. 40 Lees-Bradner.
MILLER, Duplex, 24" Cincinnati.
MILLER, Univ., No. 4 Cincinnati.
PLANER, 30"x30"x8' Liberty, M.D.
PRESS, S.S., 250 Ton Chambersburg, Hyd.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 26" Farquhar.
SHEARS, 12' x 18 ga., 11' x 1½".
SHEAR, Sq. No. 372 Steil, 72"x⅛".
UPSETTER, 4" National, M.D.

**LANG MACHINERY COMPANY**
**28th St. & A.V.R.R. Pittsburgh, Pa.**

## ALL LATE TYPE TOOLS

16" x 54" LeBLOND Toolroom Lathe
No. 3 BARDONS & OLIVER Turret Lathe
No. 3 WARNER & SWASEY Turret Lathe
No. 3B BROWN & SHARPE Plain Miller, mtr. in base, double overarm
No. 4 CINCINNATI Plain Mill, dial type
No. 1224 KEARNEY & TRECKER Simplex
20/24" GOULD & EBERHARDT Industrial Universal Shaper
32" OHIO Heavy Shaper, power downfeed
36" OHIO Extra Heavy Duty Shaper
No. 615A FELLOWS Gear Shaper
6" x 18" CINCINNATI Cyl. Grinder
12" GLEASON Bevel Gear Generator

O'CONNELL MACHINERY CO.
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BEdford 8500

### "WALSH" PUNCH PRESSES

| Size | Stroke | Delivery |
|---|---|---|
| 6 Ton | 1¼" or1½" | 10 days |
| 12 Ton | 1½" or 2" | Immediate |
| 18 Ton | 2" x or 2½" | Immediate |
| 20 Ton | 2½" or 3" | Immediate |
| 24 Ton | 2" or 2½" | Immediate |
| 28 Ton | 2½" or 3" | Immediate |
| 38 Ton | 3", 3½" or 4" | Immediate |
| 55 Ton | 3" or 3½" | Immediate |
| 65 Ton | 4" or 4½" | Immediate |

All Presses Complete with Drive, Motor, Counting and Safety Devices. Roll Feeds For All Presses. Two Weeks Delivery. Time Payments Arranged. Exclusive Distributors.

**SCHULTZ & ANDERSON CO.**
115 Edison Place, Newark, New Jersey
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Roller Type Scalping Machine 22" Slab Capacity
#1A W&S Turret Lathes Bar Feeds
Libby 26" Turret Lathe, 4½" Hollow Spindle
#33 ExCello Ext. Thread Grinders
Norton Ext. Plain Grinder 24"x36"
Landis #3 Universal Cyl Grinder 16"x48"
Lees Bradner CT 36" Thread Millers
B&S #4, 36" Gear Cutters
Fellows 615 Gear Shaper
Farnham Forming Roll 12'
Onsrud Router Model A-4-RR 84"
Herman 40"x72" Molding Machine
#3 LeBlond Plain Milling Machine

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1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

National Bent Shank Nut Tappers Battery of 5/8" to 1" Machines.
Waterbury-Farrel Fdry. 5/8" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

**National Machinery Exchange**
**128-138 Mott St., New York 13, N.Y.**

THE LARGEST MACHINE TOOL PLANT IN THE U.S.A.

# Eastern OFFERS FROM STOCK

DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

## ENGINE LATHES

10x20" centers Monarch EE Geared Head, m.d., latest
10x24" Logan, cone, motorized
13x30" centers Pratt & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model B, m.d.
14x30" centers Lodge & Shipley Selec. Head, m.d., latest
14"x54" centers Bradford Geared Head, m.d., taper
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x8' American Geared Head, m.d.
14"x8' Cincinnati Geared Head, m.d.
14"x8' Pratt & Whitney, cone
15"x6' LeBlond Geared Head, m.d.
16"x36" centers Pratt & Whitney Type B Geared Head, m.d., taper
16'x6' Hendey Geared Head, m.d.
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x30" centers Monarch Geared Head, m.d.
16"x10' Hendey Yoke Head, taper
17"x6' LeBlond Geared Head, m.d.
17'x12' LeBlond Geared Head, m.d., taper
18'x52" centers American Geared Head, m.d., taper
18"x6' Hendey Yoke Head
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley Cone head
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Cincinnati, cone
18"x10' Lodge & Shipley Selec. Head, m.d.
19"x10' LeBlond Geared Head, m.d.
20"x8' American Geared Head, m.d., taper
20"x10' Sidney Geared Head, m.d.
21'x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' Monarch Geared Head, m.d., taper
24"x14' Boye & Emmes, cone, taper
24"x24' American, cone
25"x60" centers Boye & Emmes Geared Head, m.d., taper, 1942 machine
26'x12' Bridgeford Geared Head, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
32"x12' Lehmann Hydratrol Geared Head, m.d., taper, late
36"x12' Lehmann Hydratrol Geared Head, m.d., taper, latest
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
50"x204" centers LeBlond Geared Head, m.d., taper, latest

## MANUFACTURING LATHES

No. 4 LeBlond Boring Lathe, 37' bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x60", 8x84", LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand Mfg., s.p.d.
11x18" LeBlond Rapid Production, m.d.
13x24" Coulter Automatic Threading, m.d.
13x24" LeBlond Rapid Production, Timken, latest
13x36" LeBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.
17"x8' LeBlond Rapid Production, m.d.
17"x8' LeBlond Automobile Mfg., m.d.
20"x8' LeBlond Mfg., m.d.
Niles-Bement-Pond Quartering Machine, m.d., new
Schauer Type NA 2B Speed Lathe, m.d.

## PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwuakee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2L Cincinnati, m.d.
No. 2HL Milwaukee, m.d., latest
No. 2 Rockford, m.d.
No. 3, 4 Kempsmith Plain Maxi-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5B Heavy Brown & Sharpe, m.d.
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.

## HAND MILLING MACHINES

No. 1 Standard, m.d.
No. 6 Whitney, m.d.
Atlas Model MF Bench, m.d.
No. 2 Productomatic, m.d.
No. 3 Garvin, m.d.

## INTERNAL GRINDERS

No. 16A—16" Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16RS Bryant, m.d., latest
No. 16—38 Bryant, m.d., latest
No. 6, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 24—36 Bryant, m.d., latest
No. 49 Heald Single End Boramatic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald Plain, long bed type, m.d., latest
No. 73 Heald Airplane Cylinder, m.d., brand new, latest
No. 74 Heald, m.d.
No. 172 Heald Gap, m.d., brand new, latest type
No. 649—16 Van Norman Automatic Oscillating Radius, m.d., latest

## SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard, m.d, 26" chuck
No. 22—12" Heald Rotary, m.d.
No. 25A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, m.d.
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
18x60" Thompson Hydraulic, m.d., late
22" Pratt & Whitney Vertical, m.d.
24x28x144" Thompson Hydraulic, m.d., latest
54" Bridgeport Knife, belt

## THREAD GRINDERS

No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal Thread, m.d., latest

## TOOL & CUTTER GRINDERS

Sterling Tool & Cutter, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 2B Sellers Drill, m.d.
No. 3 Gallmeyer & Livingston, m.d.
Cincinnati Monoset, m.d.
Gleason Cutter, m.d.
No. 4T Sellers Tool, m.d., latest
No. 51 Oliver Drill, m.d.

## MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 0-8 Cincinnati Model EA, m.d., latest
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
No. 1-18 Cincinnati, m.d., latest
No. 2 Sundstrand Electromill, m.d., latest
No. 2-18 Cincinnati, m.d., latest
No. 2-18 Cincinati, m.d., with rise & fall, latest
No. 2-24 Cincinnati, m.d., latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 56-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
No. 33 Kempsmith Mfg., s.p.d.
No. 34-36 Cincinnati Duplex Hydromatic, with tracer control, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., with tracer control, latest
Sundstrand Rigidmill, m.d.
4" Pratt & Whitney Spline, m.d.
18", 24" Cincinnati Plain Automatic, m.d.
24", 48" Cincinnati Duplex Automatic, m.d.
36"x24"x8' Ingersoll, 1 rail, 2 side heads, m.d.
30"x36"x12' Ingersoll Slab, 2 heads, m.d.
72"x6' Ingersoll Single Horizontal Spindle Traveling Housing Milling Machine, m.d.
96"x22' Ingersoll, as above

## UNIVERSAL MILLING MACHINES

No. 2 Cincinnati, cone
No. 2 Cincinnati Medium Speed Dial, m.d., latest
No. 3 Brown & Sharpe, cone, motorized
No. 3 Cincinnati Medium Speed Dial, with motor driven overarm, vertical attachment, latest
No. 3 Kempsmith, cone
No. 4A Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4G LeBlond, s.p.d.

## THREAD MILLING MACHINES

No. CT-36, CT54 Lees-Bradner, m.d., latest
Hall Planetary, m.d.
4½x12", 6x14", 6x48", 6x80" Pratt & Whitney
10x24" Hansen-Whitney, m.d., latest

## PLAIN CYLINDRICAL GRINDERS

No. 5—3x18" Brown & Sharpe, m.d., latest
6x18" Cincinnati Hydraulic, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Landis, m.d.
6x30" Cincinnati Hydraulic, m.d.
6x32" Fitchburg Type A, m.d., late
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, with spline grinding attach.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati, m.d.
14x48" Cincinnati Self-Contained, m.d.
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.
26x96" Landis Self-Contained, m.d.
24x120" Cincinnati Plain Self-Contained, m.d., 1942 machine

## UNIVERSAL CYLINDRICAL GRINDERS

12x24" Cincinnati Self-Contained, m.d., latest mechanical type
No. 2—12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., latest
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, m.d., latest
12x48" Cincinnati, arranged for spline grinding
12x48" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

## DISC GRINDERS

No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
No. 4 Gardner Disc, m.d.
7½ H.P. Standard, m.d., new
7½ H.P. United States, m.d., new

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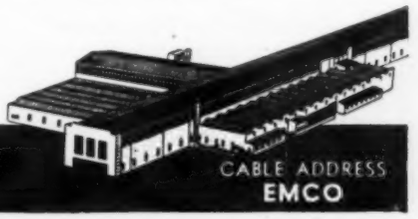

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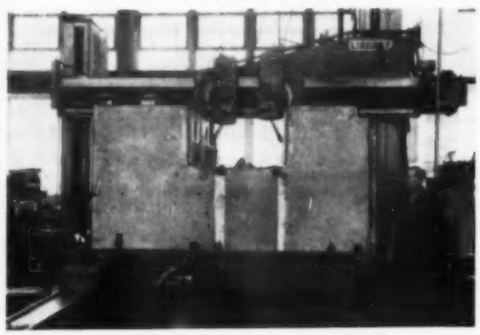
CABLE ADDRESS EMCO

# BIG MACHINE TOOL VALUES!

OUR PROGRAM of replacing 5-year old planers of our own manufacture with new machines of latest Liberty design, enables us to offer—for sale for a limited time only—several planers of late design at bargain savings to buyers in need of top-quality tool equipment. Units listed below are now in service in our plant. All in perfect operating condition. Available in 30 to 120 days' time.

1—30"x30"x12' Liberty Openside. 2 heads on cross rail. 1 side head. Tool lifters. 10 HP var. voltage drive, 3-ph., 60 cycle, 220 volt. Force feed lubr. Speeds from 20 to 171 ft. per min. Built in 1943.

*Prices on used Lathes and Grinders on request*



1—84"x84"x40' Liberty Double Housing. 2 rail heads equipped with tool lifters; 2 side heads. Max. width between housings, 85". Max. hght. under rail, 85". Side heads equipped with infeed. Rapid traverse. Aut. elect. clamping. 75 HP var. voltage drive, 4½ to 133 ft. per min. Generator motor, 25 HP, 3-ph., 60 cycle, 220/440 volt current. Built in 1943.

1—112"x76"x28' Liberty Convertible. 2 offset type rail heads; 2 side heads; indiv. motors on each head. Rapid traverse. Tool lifters. Latest type var. voltage drive. Speeds 8 to 240 ft. per min. All latest features. Built in 1941.

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(6) CLEVELAND RIGIDTURNERS MODEL No. 616. Original Cost $7,000.00. Excellent Condition. PRICE....$2,000.00 ea.

(1) POTTER & JOHNSTON #5D2 AUTOMATIC CHUCKING MACHINE. Two Spindle, Mfg. in 1942. Excellent Condition. Serial No. 52913. PRICE $4,850.00

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(1) 200 Ton HYDRAULIC STRAIGHTENING PRESS. Mfg. by Hydraulic Press Co., Length of Bed 240", Width 24", Clearance Between Rods 30". PRICE $4,500.00

(1) NO. 33 EXCELLO THREAD GRINDER. Serial No. 4714, Mfg. in 1943. Excellent Condition. PRICE.....$3,000.00

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(1) NO. 75-A HEALD INTERNAL GRINDER. Serial No. 22065. Excellent Condition. PRICE .....$2,250.00

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(1) LANDIS 18 x 18 EXTERNAL GRINDER. Excellent Condition. PRICE....$2,250.00

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MONA MEMBER

**WINSTON MACHINERY COMPANY, Inc.**
517-23 SOUTH DELAWARE STREET, INDIANAPOLIS 4, IND.



## BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 jaw

4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.

3½" & 4" Landis Floor Type Mills

3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support, 1942.

48"x20' centers N.B.P. Lathe, Grd. Hd.

42"x96" centers Amer. Lathe, Grd. Hd., M.D.

48"x¼" Roller Leveller, 11—4" rolls

10'x3/16" Niagara Shear, 20" gap.

36"x32" bed Niles Lathe, 2 carr., T.A.

16"/18½"x54" cc Springfield, TA, '44

7' Carlton 17" col. Radial, 1943

Nos. 5, 4, 3 & 2 W. & S. Turrets, Late

#4 Gisholt Univ. Turret Lathe, 1942

No. 1L Gisholt Univ. (3) 1945

36"x36"x12' Cinci. Hypro Planer, 4 Hds., Var. Voltage, 1943

48"x48"x12' Cinci. Planer, 4 hds., M.D.

24"x24"x16' Ingersoll Planer Type Miller, 4 hds., 20 H.P. AC, M.D.

4K K. & T. Miller, Hor. Dial

48" N.B.P. Slotter, Grd., Late

15'x¾" Wicks, Bending Rolls, M.D.

**BENNETT MACHINERY CO.**
30 Church St., New York 7, N. Y.



No. 4 Cinn. Vert. High Power Mill, M.D.
No. 1½ B & S Univ. Mill, M.D.
Burke No. 4 Mill, M.D.

MONA MEMBER

**D. E. DONY MACHINERY CO.**
47 Laurelton Road, Rochester 9, N.Y.



Bor. Mill, Hor. 3" G and L, M.D.
Boring Mills, 24"-30"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Squaring Shear, Niagara 11'x10 gauge

**West Penn Machinery Company**
1210 House Bldg. Pittsburgh, Pa.



## SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

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# LATEST TYPE NEARLY NEW MACHINES

MONARCH 22" x 456" centers, Model CM, Precision Engine Lathe, Timken Bearing, with 3 carriages, taper attachment for one carriage, Latest Type

## BORING MILLS—Horizontal

CINCINNATI-GILBERT 3¼" Bar, Floor Type, Latest
DETRICK & HARVEY 4" bar, Floor Type
GIDDINGS & LEWIS #25, 2½" Bar, M.D.
HEALD 48A, 49 Single End Bore-Matics, Latest
NILES BEMENT POND 5", 6" bar, floor type, M.D.
UNIVERSAL 3" bar, latest type

## BORING MILLS—Vertical

BETTS 120" 2 swivel heads, AC, M.D.
BULLARD 36" Vertical Turret, Side Head, PRT, M.D.
BULLARD 36" Vert. turret "Spiral" Latest
BULLARD 61" Maxi-Mill, 2 heads, Motor Drive
BULLARD 16" 6 spindle, 8 spindle, Mult-au-matic, Type D Single Indexing, Latest Type
KING 52", 62" 2 swivel heads, PRT, M.D.
NILES 38-44 Vert. Turret Side Head, PRT, M.D.
NILES 84" 2 swivel Heads, PRT, M.D.
NILES 100" 2 Swivel Heads, PRT, M.D.

## BROACHES

CINCINNATI 1-30 Duplex Vert. Hyd., Latest
CINCINNATI 3-30 Duplex Vert. Hyd., Latest

## GEAR CUTTING EQUIPMENT

BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS Model Z Gear Shaper, High Speed, Latest
FELLOWS 61, 615A, 7, 7A, 72, 75, 77, 61A High Speed Gear Shapers, latest type
FELLOWS Type 6Z2 Gear Shaper, High Speed, Latest
FELLOWS #13 LS Lapping, Latest Type
GLEASON #20 Spur Gear Tester, Latest Type
GLEASON 3", 12" Straight Bevel Generator, latest
GOULD & EBERHARDT 12H, 12HS Hobber, Latest
PRATT & WHITNEY 10" Grinder, hyd., latest

## GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3 Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, hyd., latest
CINCINNATI 16"x36", Plain, "Filmatic", Latest
LANDIS 4"x12", 4"x18" Type H, Plain, Hyd., Latest
NORTON 6"x18", Type C, Plain, Hyd., Latest

## GRINDERS Surface

BLANCHARD #11—16 chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—M.D.
DO-ALL Model G-10, 8"x24", Hyd., Latest Type
DO-ALL Model G-7, 9"x20", Hyd., Latest Type
GALLMEYER & LIVINGSTON #35, 8"x24", Latest
HEALD #22, 12" chuck, Rotary, latest type
HEALD 25A, 16" or 30" Chuck, Rotary, Hyd., Latest
MATTISON 14x24x72 Hydraulic, Latest Type
MATTISON 14x14x60 Hydraulic, latest type
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 12"x24" Hydraulic, Model B, Latest Type

## LATHES—Engine and Mfg.

AMERICAN 18x72" centers, Geared, M.D.
AMERICAN 36"x360" centers, 2 carriages, M.D.
BRIDGEFORD 36"x24' centers, 2 carriages, M.D.
JONES & LAMSON "FAY" 20"x25" Automatic, Latest
LeBLOND 25x96" centers, Geared, M.D.
LEHMAN 16x30 hydratrol, Timken, latest type
LODGE & SHIPLEY 18"x72" centers, M.D.
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest
MONARCH 12x54" centers Timken, Latest Type
MONARCH 10x20" centers, Model EE Timken, Latest
MONARCH 12x30" centers, Timken, Latest Type
MONARCH 18"x48" centers, Timken, Latest
MONARCH 24"x54" centers, geared, Motor Drive
NILES 42"x60", double head, M.D.
NILES 48x87' centers, comb. Bor. and Turn., M.D.
NILES 72"x62', centers, comb. Bor. and Turn., MD
NILES 30x50' Boring, Timken, Latest Type
PRATT & WHITNEY 16"x60' Centers, geared, M.D.
PUTNAM 42"x25' centers, geared, Motor Drive
REED PRENTICE 16x24" centers, geared hd., M.D.
SCHUMACHER & BOYE 24"x158" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

## LATHES—Turret

BARDONS & OLIVER #5, #7 Timken, latest
CINCINNATI ACME No. 1, Latest Type
FOSTER 4FU, Fastermatic, Timken, Latest
GISHOLT #3, 4, 5 Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest Type
JONES & LAMSON #3, #5, #8A Univ., Latest
LIBBY 1H-5, 5⅝ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4 Timken, latest
POTTER & JOHNSON 5D, 5D2E, Timken, Latest
WARNER & SWASEY 2A, Univ., Bar & Chuck, with or without "PRE-SELECTOR", Latest
WARNER & SWASEY #5, Univ., Timken Bearing
WARNER & SWASEY #1A, Univ., Latest Type

## MILLING MACHINES—Mfg.

INGERSOLL 42x38x12' Planer type, Adjustable rail, 4 heads, AC, M.D.
INGERSOLL 32x30x12' Planer Type Slab, AC, M.D.
INGERSOLL 32x24x16' Planer Type 2 heads, AC, M.D.

## MILLING MACHINES—Plain

BROWN & SHARPE 2B, 3B, Timken, Latest
BROWN & SHARPE No. 2 Light Type, Timken, Latest
BROWN & SHARPE #12 Timken Bearing, latest
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #3, 4, 5, Motor Drive
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI 0-8 Auto. rise and fall, Timken, Latest
KEARNEY & TRECKER #3, 4 heavy, Timken, latest
KEARNEY & TRECKER 1218, simplex, latest
KEMPSMITH #4 Maxi-Mill, Timken, latest

## MILLING MACHINES—Vertical

CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
GORTON 9J Super Speed, Latest Type
KEARNEY & TRECKER 3H Timken, Latest
REED PRENTICE 3VG with or without Hydraulic Duplicator, Timken Bearing, latest type

## PLANERS

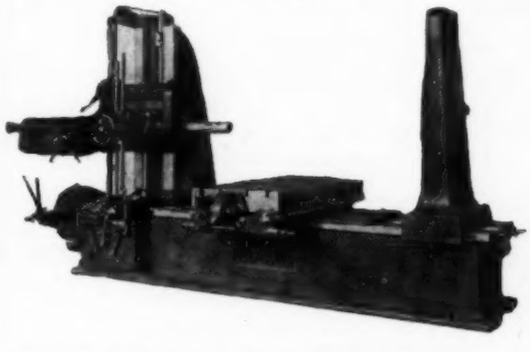
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36x36x8', 2 heads, maximum duty, DC, M.D.
NILES BEMENT POND 48x48x16', 4 heads, AC, M.D.
NILES 48x48x12' 3 Heads, DC, M.D.
NILES 54x54x18' 4 Heads, Box Table, DC, M.D.

## PRESSES

BIRDSBORO 325 ton, vert. hyd., Latest Type
CHAMBERSBURG 50 ton vert. hydro-pneumatic
CLEARING Type DS 1125-32 dbl., action 125 ton, Latest Type
CLEARING Type H-50-36-35-ton Vert. Hyd., Latest
FERRACUTE #DG-55, 75 ton drawing, Latest Type
HPM 37-ton Vertical Hydraulic, Latest

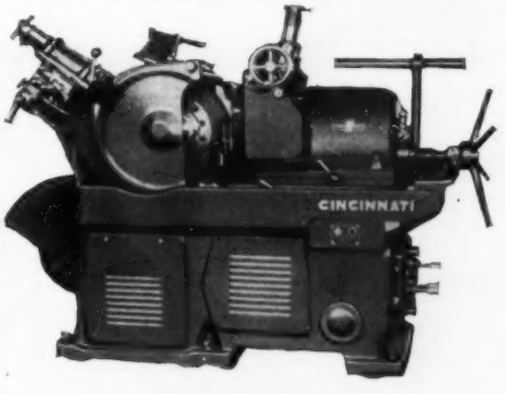
## MISCELLANEOUS

AJAX 1½", 3½", Bolt Heading, Upsetting and Forging
BARNES #172, 306H, 307 Vertical Hone, Latest Type
BROWN & SHARPE G, 4 High Speed ASM Latest
CLEVELAND 12"x16" Cutter Reliever, Motor Drive
CONEMATIC 2⅝" 6 spindle ASM Latest
GOSS & DeLEEUW 8" auto. chucker 5 spdle. Latest
JONES & LAMSON 6x15", 8x18" thread grinder, latest
LEES BRADNER HT, 12"x24" Thread Miller, Latest
MICHIGAN #1708A Cutter Reliever, Latest Type
PRATT & WHITNEY 6"x60" Thread Miller, Latest
PRATT & WHITNEY "Keller" Type G, Type BL2416 —Latest Type
PRATT & WHITNEY ½Bx30, ½Bx50 2 spindle Deep Hole Drill, Latest
PRATT & WHITNEY ½Bx50 2 spindle Rifler, Latest
RACINE 30C, 10"x10" Hack Saw, Hyd., Latest



LUCAS #41 Horizontal Boring, Drilling and Milling Machine Precision Type, Diameter of spindle 3", Table 34"x48", Latest Type

CINCINNATI #2 Centerless Grinding Machine Model EA "Filmatic", Latest Type

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***(Partial List) Over 2,000 Machine Tools In Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured***

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**CABLE ADDRESS: WOODWORK, N. Y.**

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### BUFFERS
Used 5 HP U. S. Electrical Tool Buffers

### DRILLS—RADIAL
5'-15" Column Carlton Radial Drill
2'-6' Plain Radial Drills
7' American
7' Cincinnati Bickford, gr. box
4' American Triple Purpose
4' Carlton, gear box
6' American Triple Purpose
5' Fosdick Plain, Gear Box
No. 2 Avey—3 spdle. late type

### GRINDERS—PLAIN
#12 Brown & Sharpe Plain Grinder
10"x24" Landis C Hyd. Univer. Grinder
No. 2 Landis Univ. belt drive
10"x24" Norton, Type BA, M.D.
16"x72" Landis, belt drive
18"x72" Cincinnati, latest type
20"x240" Landis, M.D.

### GRINDERS—TOOL & CUTTER
#51—510 Oliver tool grinders
#13 Brown & Sharpe Cutter Grinding Machine
#2 Cincinnati Tool & Cutter Gr. New 1942

### GRINDERS—SURFACE
6"x18" Thompson Hydr. Surface grinder
14"x18"x72" G & L Model A Hyd surface grinder
12"x48" Cincinnati Grinder

### LATHES
#6 LeBlond Multi-cut
10" Rivett Bench Type
14"x5' Lodge & Shipley Belt dr.
14"x6' Hendy Yoke Hd.
14"x6' LeBlond Gr. Hd.
14"x6' Lodge & Shipley cone belt dr.
16"x6' American Belt drive
16"x14' South Bend loose ch belt dr.
18"x6' Boye & Emmes Belt drive
18"x9' L & S Bowl hd.
19"x8' Sidney Lathe Bowl Type

### LATHES (Cont.)
20"x10' Lodge & Shipley Belt dr.
24"x12' American 8 Sp. Gr. Hd.
24"x22' Lodge & Shipley Gr. Hd.
25"x12' LeBlond Gr. Hd.
30"x12' LeBlond Belt dr.
36"x12' Centers American Gr. Head
36"x36' American Geared Head
20"x6' Bed young speed Lathe
30"x10' Centers Nile Timesaver

### TURRET LATHES
21" Gisholt Turret Lathe
3L Gisholt Turret Lathe
#4 Millholand
2¼x24" J & L Flat turret
3½x32" J & L Flat turret
36" Bullard Univ.

### MILLING MACHINES
Sundstrand 00 Hydraulic
1-8 Kent Owens Hydr.
#118 Van Norman Production Millers
28" Cincinnati Semi-Automatic
New Burke Hand Millers
1½ BS Double overarm miller
#21 B & S Plain
3S Cincinnati Plain
2B—B & S meter in base
#4 Cincinnati Horiz. Dial Type
#3 Cincinnati Medium Speed Dial type, Vert.
40" Ohio Tilted Rotary Miller

### SPECIAL
#3—12 Arter Surface Grinder

### PLANERS
30"x30"x20" Gray Planers
42"x42"x20" Cincinnati Planer
72"x72"x20" Niles Bement Pond
42"x42"x20" Cincinnati Hypo

### SHAPERS
14" Steptoe Belt Dr.
15" Smith & Mills
20" G & E Shapers
20" Ohio Belt Dr.
24" Cincinnati Belt dr.
24" Potter & Johnson

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**Cincinnati Machinery Co., Inc.**
**219 East Second Street**
**Cincinnati 2, Ohio**



## FOR SALE LIKE NEW

CINCINNATI INTERNAL & EXTERNAL HYDRAULIC UNIVERSAL GRINDER 12" x 36" WITH FILMATIC BEARINGS and PRATT & WHITNEY JIG BORER #2 ROWBOTTOM CAM MILLER.

**CAPITOL MACHINERY CORP.**
**253 Centre St., New York 13, N. Y.**



# McDONALD
## USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive No. 34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp, Speeds Modes "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D. & 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

MDNA MEMBER

**McDONALD MACHINERY CO.**
**1531-35 No. B'way., St. Louis 6, Mo.**



## AUTOMATICS
No. 0G Brown & Sharpe
8" Bullard Multamatic
No. 2F Foster "Fastermatic"
⅞" x 1¼" Cone 4 spindle
1-1/16" Cleveland Model M
1⅞" Conomatic 8 spindle
2" x 18" Cleveland Model B
No. 454 New Britain 4 spindle
14" x 18" Monarch Mag-Na-Matic
14" x 19" Fay Automatic lathe
15" x 22½" Sundstrand Auto. stub
6" Sundstrand Auto. stub
1" Economy bolt head shaver

## BORING MACHINES
Vernon vertical jig borer
No. 2 Pratt & Whitney vertical jig borer
2½" No. 25T Giddings & Lewis horiz.
3" No. 3A Universal horiz.
3¾" No. 32 Lucas horiz.
4" Model 42 Lucas precision horiz.
4½" No. 33 Lucas horiz.
7" Barrett cylinder borer
24" Bullard vertical turret lathe
42" Bullard vertical turret lathe
100 Niles-Bement-Pond vertical
No. 42 Heald Bore-Matic
No. 47A & 48A Heald Bore-Matic
No. 4HH Baker 2 way drill
Munson double end borer

## DRILLS, MULTIPLE
6 or 8 spindle No. 11 Natco
12 spindle No. 39 Natco, rail type
22 spindle No. 14 Natco
24 spindle No. 2 Baush
34 spindle No. 30 Natco
42 spindle No. B16 Natco
No. B4A Natco multiple or Hole tapper
Baush horizontal 2 way multiple

## GRINDERS, INTERNAL
No. 72A5 Heald hydraulic with cross sliding head
No. 72A5 Heald plain with extended bridge
No. 72A3 Heald plain with cross sliding head
No. 72A3 plain with facing attmt.
No. 72A3 Heald Sizematic centerless
No. 72A3 Heald Sizematic internal
No. 72 Heald Sizematic internal
No. 75A Heald internal, cross feeding headstock
No. 75 Heald internal
Size IG Gronby internal gdr.
Majestic internal grinder
No. 42 Van Norman grinder
No. 16 A16 Bryant, internal and facing
No. 16 CP16 Bryant
No. 16-28 Bryant
No. 16-38 Bryant
No. 24-36 Bryant
MH1 Sav-way hydraulic feed internal

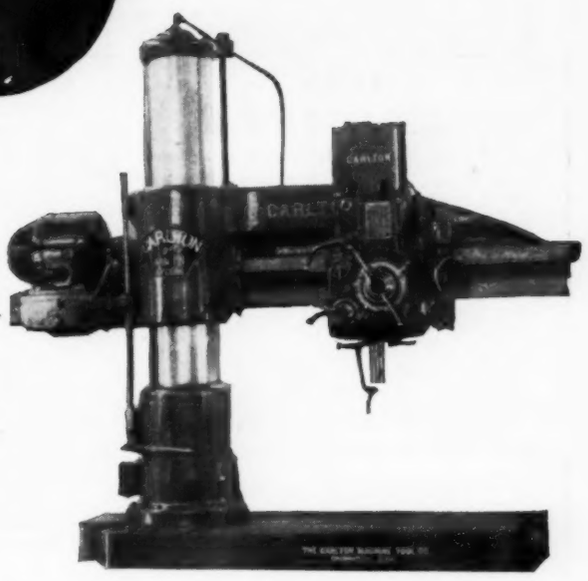
## LATHES
14" x 6' Mulliner
14" x 6' Lodge & Shipley
14" x 8' American
15" x 6' Porter McLeod
16" x 30" centers Monarch
18" x 8' Rockford
36" x 16' Bridgeford

## SHAPERS
6" Pratt & Whitney vertical
16" Gemco
16", 24" & 28" Gould & Eberhardt
20" & 24" Gemco universal, New.
24" Columbia universal

## UPSETTERS
4" Ajax twin geared
2" Acme

**MILES MACHINERY CO.**
**SAGINAW, MICH.**

# MODERN
*used and rebuilt*
# MACHINE TOOLS



**6′ 17″ CARLTON RADIAL DRILL, with motor on arm, enclosed head, 96 spindle speeds (10 to 1250 RPM), 18 feeds (.004″ to .125″) #6 morse taper, electric clamping device, box table, DC motors and controls. New 1942.**

## PARTIAL LIST OF MACHINES NOW IN STOCK

### AUTOMATICS
Bullard Mult-Au-Matic, 6 spdl. Model D. 1941.
6″ Conomatic, 4 spindle. 1943.
6″ Goss & DeLeeuw Chucker, 8 spdl. 1943.
2¼″ Cleveland, Model A. 1944.
1⅝″ Greenlee, 6 spindle. 1942.
9/16″ & 1″ RA 6 Acme Gridley. 1943.

### BORING MACHINES
No. 40 Universal "Triway". 4″ bar. Late.
No. 49 Heald "Bore-Matic." 1942.
No. 47A Heald "Bore-Matic." 1942.
No. 2112A Excello. 1943.

### DRILLS, RADIAL
4′ 11″ Carlton. 1943.
3′ 9″ Cincinnati Bickford. 1943.
3′ 9″ Dresses. Late.

### DRILLS, UPRIGHT
No. 36 HO Baker. 1942.
No. H3 Barnes Vert. Hydram. 1942.
25″ Fosdick Economax. 1941.
24″ Sibley Sliding Head. 1942.
No. 3 Bausch Multiple Spindle.
Fox Multiple Spindle. 1944.
Barnes 2 Spindle Deep Hole. 1943.

### DRILLS, SENSITIVE
No. KH2 Allen, 6 Spindle. 1943.
No. 2 MS Allen, 1 to 3 spindle. 1942.
No. 2 Motor-Avey, 3 spindle. 1942.
No. 2B-8 Edlund, single spindle. 1942.
No. 2 Hamilton-Muehlmot. 1943.
Leland-Gifford, single spindle. 1942.

### GEAR CUTTERS
No. 5 AC Lees Bradner Gear Gen. 1941.
No. 7A & 715 Fellows Gear Shaper. 1942.
Model 615A Fellows Gear Shaper. 1944.
Model GCL-3 Red Ring Gear Shaver. 1942.
Type S Barber Colman Hobber. 1942.

### GRINDERS, CYLINDRICAL
14″ x 36″ Norton Type C Universal. 1943.
10″ x 48″ Norton Type C Plain. 1941.
10″ x 36″ Landis Type C Plain. 1944.
10″ x 24″ Landis Type C Universal. 1942.
10″ x 18″ Norton Type C Plain. 1942.
6″ x 18″ Landis Type C Plain. 1941.
4″ x 12″ Landis Type H Plain. 1942.
No. 2 & 3 Cincinnati Centerless. 1942.

### GRINDERS, INTERNAL
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald, two motor. 1943.
No. 72A3 Heald Plain. 1942.
No. 72A5 Heald Plain. 1944.
No. 16 CP-16″ Bryant. 1942.
No. 104 Rivett. 1942.

### GRINDERS, SURFACE
16″ x 16″ x 48″ Thompson, Type C. 1943.
12″ x 12″ x 40″ Thompson, Type B. 1942.
No. 3B Abrasive. 1942.
No. 2B Reid. 1944.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.

### GRINDERS, TOOL & CUTTER
No. 2 Cincinnati Univ. 1941.
No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide Tool. Late.
Barber Colman Combination. 1943.
No. 44, 48 and 49 Excello. 1942.

### LATHES, ENGINE
20″ x 48″ Lodge & Shipley. 1941.
18″ x 54″ Lodge & Shipley. 1943.
18″ x 54″ Sidney. 1943.
18″ x 48″ Bradford. 1942.
16″ x 8′ South Bend c.d. 1944.
14″ x 78″ Reed Prentice. 1942.
14″ x 54″ Reed Prentice. 1942.
14″ x 30″ Hendey. 1939.
14″ x 30″ Lodge & Shipley. 1943.

### LATHES, PRODUCTION
14″ x 42″ Monarch "Magna-Matic." 1941.
9″ x 20″ Lipe. 1942.
8″ x 36″ Lo-Swing Semi-Auto. 1942.
8″ x 21″ Fay Automatic. 1942.
8″ x 15″ Sundstrand, Model 8. 1942.
Model 1MP & R Lo-Swing.

### LATHES, TURRET
No. 3A Warner & Swasey. 1943.
No. 2A Warner & Swasey. 1942.
No. 9A Jones & Lamson. 1942.
No. 1 Acme Universal. 1941.
No. 3L Gisholt. Late.
No. 2L Gisholt.
No. 5 Warner & Swasey. 1941.
No. 4 Warner & Swasey. 1941.
No. 3 Warner & Swasey. 1943.
No. 2 Warner & Swasey. 1941.
No. 2, 3 & 7 Bardons & Oliver. 1941.
No. 3 & 4 Gisholt. 1943.

### MILLING MACHINES, PRODUCTION
No. 34-36 Cincinnati "Hydromatic." 1942.
No. 3-36 Cincinnati "Hydromatic." 1943.
No. M-24 Milwaukee "Simplex." 1942.
No. 1248 Milwaukee "Simplex." 1942.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati. 1942.
No. 12 Brown & Sharpe. 1942.
No. 1-14 Kent Owens. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 00 & 2 Sundstrand. 1943.

### MILLING MACHINES, PLAIN
No. 3B Brown & Sharpe. 1941.
No. 3 Kempsmith-Maxmiller.
No. 2H Milwaukee. Late.
No. 2M Cincinnati.
No. 2B Brown & Sharpe.
No. 1 Brown & Sharpe.
Van Norman Hand Mill.

### MILLING MACHINES, UNIVERSAL
No. 2A Brown & Sharpe. Late.
No. 2M Cincinnati.
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.

### MILLING MACHINES, VERTICAL
No. 2 Milwaukee, Model D. 1945.
No. 3H Milwaukee. 1940.
No. 2K Milwaukee. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.
No. 40-H Index.

### MISCELLANEOUS
No. CPC 6-30 LaPointe Vert. Broach. 1941.
50KVA Federal Spot Welder. 1942.
No. 616 Cleveland Rigidturner.
No. 26F Norton "Hydrolap." 1942.
No. 74 Excello Center Lapping Mach. 1942.
No. 1 Savage Nibbling Machine.
5 HP Clark Buffer.
100 Ton Hannepin Hydraulic Press. 1942.
No. 45 Reliance Punch Press. 1945.
No. 8-6 Zeh & Hannemann Punch Press. 1942.
No. 14¼ Williams & White Single End Punch.
No. 3C Hendley & Whittemore Punch & Shear.
Type D Langlier Swaging Machine. 1941.
3′ Leland Gifford Radial Tapper. 1941.
No. 1 Savage Roller Type Nibbler. New.
No. G824 Parker Tube Bender.

### PLANERS & SHAPERS
52″ x 36″ x 40′ Cincinnati Planer.
42″ x 42″ x 20′ Cincinnati Planer.
36″ x 36″ x 16′ Ohio Planer.
28″ Smith & Mills Shaper.
16″ Gould & Eberhardt Shaper.
6″ Pratt & Whitney Vertical Shaper.

### SAWS
14″ x 20″ Racine "Shear Cut." 1942.
13″ x 13″ Peerless Universal. 1943.
11″ x 11″ Peerless "Hydra Cut." 1945.

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*Indianapolis*
**MACHINERY & SUPPLY CO., INC.**
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# HEADLINERS

**EXTRA LARGE HORIZONTAL BORING MILL**

#43 LUCAS Horizontal Boring, Drilling & Milling Machine, AC MD, 4½" diameter spindle, *20 feet from faceplate to outer support*, 48" height over table, 72"x72" table, with auxiliary table. Excellent condition.

### LATHES

12"x5' SEBASTIAN Model R Grd Hd., new 1947
14"x6' AMERICAN 12-speed Grd Hd, AC MIB, taper
16"x54" ctrs AMERICAN "Pacemaker", taper, chucks, collets, (1943)
20"x8' LODGE & SHIPLEY Selec Grd Hd, AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG bowl hd
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x14' LODGE & SHIPLEY, Turner Drive, Taper
30"x16' LODGE & SHIPLEY, Lima Drive, taper

### MILLERS

#1M CINCINNATI Rect. O/A Pl., AC MIB
#2 CINCINNATI H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#2B MILWAUKEE Plain, AC MD, DOA
#2M CINCINNATI Plain, AC MIB, Timken, #50 spindle
#4 CINCINNATI H.P. Univ., Lima Drive, div hd, vert hd, slot attach
#4B BROWN & SHARPE Plain, AC MIB, DOA, #50 spindle
6"x84" PRATT & WHITNEY Thread

### SHAPERS & PLANERS

14", 24", 28", 32" GOULD & EBERHARDT High Duty
28" AMERICAN H.D., AC MD
30"x30"x8' CINCINNATI, AC MD
36"x36"x16' GRAY, AC MD, 4 hds

### DRILLS

#2 COLBURN Mfg.
#3 AVEY, AC MD, 12" OH
21" & 24" CINCINNATI-BICKFORD slid hd
24" CINCINNATI-BICKFORD "Super Service" (1943)

### RADIAL DRILLS

3' CINCINNATI-BICKFORD, AC MD thru gearbox
4' MORRIS, MD
6' CINCINNATI-BICKFORD mtr on arm
7' DRESES, 17" col., AC MD thru gearbox

### GRINDERS

8"x18" CINCINNATI Saddle Type Cyl., AC MD
#3 ABRASIVE Surface, AC MD

### BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
#43 LUCAS Horiz., AC MD, 4½" bar, 20' betw faceplate & outer support
36" BULLARD "New Era" Vert. Turret Lathe, AC MD

### GEAR MACHINERY

#1 ADAMS Hobber, AC MD
#18H GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD
#36H GOULD & EBERHARDT Hobber, AC MD
#61 FELLOWS Shapers
#6—60" BROWN & SHARPE Cutter

### TURRET LATHES

#2B FOSTER Univ. Grd Hd, SPD
#4-W CINCINNATI ACME Univ., AC MD, thread chasing
#2-L GISHOLT, "Prescisetor", bar feed (1943)

### MISCELLANEOUS

#4 WATERBURY-FARRELL Thread Roller, AC MD
2½" LANDIS Double Head Bolt Threader, AC MD
10" PRATT & WHITNEY Vert. Shaper
10'x16 ga. CHICAGO Steel Leaf Brake, AC MD
INGERSOLL-RAND XB2 Air Compressor, 888 cu. ft., AC MD
#402E BARRETT Oil Extractor

***YOUR INQUIRIES SOLICITED***

**COX MACHINERY CO.,**
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OFFICE AND WAREHOUSE 311-313 Bakewell St. Covington, Kentucky
*Three minutes from the Cincinnati hotel district.*

# SPECIAL OFFERINGS

American 36"x18' Geared Head Lathe, M.D.
Lodge & Shipley 44"x21' Geared Head Lathe, M.D.
American 24"x10' Lathe, Geared Head, M.D.
American 4'9" (Hole Wizard) Radial Drill
American 4'13" Column Radial Drill, Reeves motor drive
Milwaukee 1218 (Simplex) Production Miller, motor driven
Cincinnati 45-48 Plain Hydromatic Milling Machine
Taylor & Fenn M-80 Duplex Spline Miller, 4" stroke

#500C Manville High speed Horizontal Reciprocating Thread Rolling Machine, Serial #4878 latest model. Cap. ½"x4" long. Semi and automatic feed, direct motor drive, 7½ HP motor. Automatic Hopper Feed. Can be arranged as #625C for ⅝" Capacity. Guaranteed like new.

*For further particulars write or wire*

**JOSEPH BEAL & CO.**
**465-471 ATLANTIC AVENUE BOSTON, MASS.**

# *Low* IN COST *Timely* SELECTIONS

### LATHES

Pratt & Whitney 16"x36" and 20"x48" model "B" Geared Head motor-in-base hole thru spdls. 1-11/16" and 2"—8 spdl. speeds.

Hendey 14"x6' and 14"x8' EBM—Taper attchmt—collets.

1—Seneca Falls short cut Lathe 14" swing 16" centers Serial No. 1624.

3—LeBlond No. 2 gun boring lathe.

3—Potter & Johnston 6DRE Timken Bearing Auto. Chuck. Machines multi V-belt MD, sw. 34" turret feed 16" hole thru spindle 2⅝"—spindle speeds 20 range 9 to 167 RPM considerable tooling.

### TURRET LATHES

4—Bardons & Oliver #3 Universal—swing 15⅜"—hole 1⅞"—Two (2) 3 HP to 1,015 RPM—hole spdle 2⅜"—swing 17½" bar feed.

### BORING MILLS

2—Bullard 24" "New Era" Vert. Boring Mills.

### MISCELLANEOUS

-—Taylor-Windfield 200 KVA.—type MSL-48-UKD seam welder.

1—Gleason 3" gear generator very late type.

***This is only a partial list.***
***Write, wire or phone for catalog.***

**Botwinik Brothers**
OF MASS., INC.
3 SHERMAN ST. WORCESTER 1, MASS

# PLANERS

48"x48"x12' Cincinnati Rapid Traverse, 4 heads
36"x36"x12' Woodward & Powell, 4 heads
32"x32"x10' Whitcomb, 2 heads
24"x24"x10' Whitcomb, 2 heads

*Older Type machines, in excellent condition*

**HAZARD BROWNELL**
**350 Waterman St., Providence 6, R.I.**
**Dexter 8880**

# SHEET METAL MACHINERY

NEW #0 BUFFALO IRON WORKER
NEW #G3120 PEXTO GAP SHEAR, 10'x10 ga., 20" gap
NEW #L37 CHICAGO BOX BRAKE, 8'x12 ga.
PRESS BRAKES: 4'x12 ga., 5'x10 ga.
SAVAGE NIBBLER, ⅜" capacity, 36" throat
#A10 STANLEY UNISHEAR, 10 ga. capacity
SPINNING LATHES: 18" to 60" swing
PEXTO POWER SHEARS, 52" and 72" x 14 ga. capacity

MANY OTHER ITEMS — SEND US YOUR INQUIRIES. COMPLETE EQUIPMENT FOR SHEET METAL WORK

**B. D. BROOKS, INC.**
**361 Atlantic Ave. Boston, Mass.**

# UNIVERSAL TURRET LATHES

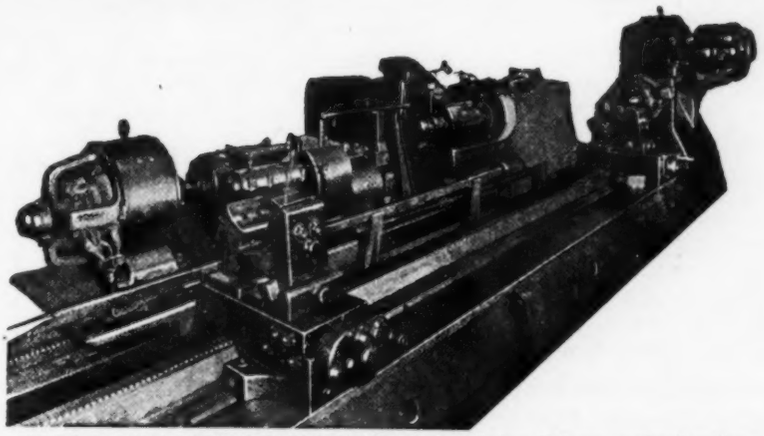
Warner & Swasey #5, Bar & Chucking, Serial #688846
Gisholt #5, bar & chucking, 1943
Warner & Swasey #4, bar & chucking, Serial #640,000
Bardons & Oliver #5, bar, 2" cap, 1942
J & L #4, chucking, 1941
J & L #3, chucking, 1941
Bardons & Oliver #3, bar, 1942
Gisholt #1L, bar & chucking, 1943
B & S #0 hand screw machine, 1942
South Bend 16"x6' turret lathe, 1943
Defiance #25A horizontal boring mill, 3¼" bar, 1940
Liberty 48"x48"x18' four head planer, 1942

**JOHNSON MACHINERY CO.**
**59 Edison Place, Newark 2, N. J.**
**Mitchell 3-7608**

## SCARCE LATE M H S

B & S AUTOMATIC 00G
Consomatic 1⅞" 8 spindle
TANNEWITZ BAND SAW #36M
3" UNIVERSAL HORIZONTAL BORING MILL
CHICAGO (D&K) #334 PRESS BRAKE
Clearing 90-10 Press Brake 12½' x 10 Ga.
KLING 10'x⅛" BENDING ROLL, POWER ELEV.
DELTA SINGLE & MULTIPLE DRILL
Walker Turner Bench Drills ½"
Excelsior 21", Buffalo 18" Drill Presses
GORTON DUPLICATORS 9J
GORTON ENGRAVERS 3U, 3L, 3Z, ME
BROWN & SHARPE #2B SURFACE GRINDER
Norton, Thompson 6"x18" Surf. Grind., Hydr.
G&L #18, 25, 35 Hyd. Surface Grinders
Abrasive #1½, 3B, 34 Surface Grinders
Heald #25A Rotary Surface
Gorton Cutter Grinders
Atlantic 6"x18 Surface
Brown & Sharpe #5 Cyl. Grinder
CINCINATI 12x36" UNIV. GRINDER, HYDR.
#2 CINN. CENTERLESS FILMATIC (2)
Covel #91A Tool & Cutter
Pratt & Whitney Radius Grinders
Hammond & Excello Carbide Grinders
Gardner #226 Disc Grinder
Black Diamond Drill Grinder
LANDIS #6 THREAD GRINDER
Ball & Jewel Plastic Grinders
NILES BEMENT POND 2500 lb. Steam Hammer
Davis #4 Keyseater, #2 Baker
Hi Speed Hammers all sizes
BOYE & EMMES 20"x30' G.H. LATHE
Monarch 10x20" Lathe Model EE
Hendey 12x30" G.H. Lathes
Lodge & Shipley 16"x78", 12 speed
S. Bend 9:3½", 10x48", 13"x5
Sebastian 12"x4' G.H. Lathe
LeBlond Regal 15"x30
Sheldon TRB-56" Lathe
Hardinge, Elgin, Rivett Precision Lathe
Cinn. & Schauer Speed Lathes
WARNER & SWASEY #3, 4 PRE-SELECTOR TURRET LATHES
Gisholt #4, 5 Univ. Turrets, Tooling
Morey #3 Turret Lathe
Acme #6W M.D. Foster 3B
Oster 601 Rapiduction
Hardinge ESM 2nd operation
GORTON VERTICAL MILL 8D, 9J, P.F. PLAIN
Nichols Hand Mill Vert. Head
Van Norman Prod. Mill
Burke #4 Mills Pl. & Univ.
Cinn. 1-12, 2-18 Prod. Mills
Brown & Sharpe #12 Electric, #000 Prod.
Van Norman #12, 26, 36 Duplex Head
Cinn. #4 Vert. Dial Type
Cleveland #1 Vert. Miller
Kent Owens IV Prod. Mills
Reed Prentice #10D6 60Z, INJ. MOULDER
MARVEL AUTO. HACKSAW #6A
BLISS PRESS #38 OB Gap, 62, 62A, 162
V&O #102 Reducing Presses
Toledo 400 Ton Knuckle Joint Press
Diamond #31, 30 ton OBI Press
Bliss #4, 5½, Styles Presses
Federal #5 OBI Press
Bliss #21 OBI Press
V&O, Z&H, OBI 25, 35 ton
Ferracute DDG 56 105 ton Double action cam press
CANEDY OTTO 3'x9" COL. RADIAL
B & S #1 Hand Screw Machine
Oliver Heavy Die Filer, 510 Drill Pointer, Sellers 4G
Onsrud Router #W240
Micromatic Hydrohoner H-1
Waterbury Farrel #30 Thread Roller & Dies 1943
Porter Cable G8 Belt Sander
Bakewell #1, Ultromat Tappers
Taylor Winfield 50 KVA Spot Welders
Thompson & Sciaky Seam & Spot Welders
Rafter Mod. 26 Tube Roller
Oliver 20" Woodworking Planer
Peerless #226, Eyeletting Mach.
Clark Hardness Tester
Gen. Flexible Elec. Screw Press

# AARON
# VALUES IN MODERN TOOLS



**NORTON ROLL GRINDER 50"x28' Centers. Motor Driven, actual swing 54". Bed divisible into two sections. *IMMEDIATE DELIVERY.***

### NEW IN STOCK

Power Foot & Gap Shears—30" to 96"

Spot & Arc Welders, 6x6" Racine Hacksaw
4, 5, 7, 10, 12, 18, & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses, Air Hydraulics
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
20 ton Northern Hydraulic Presses
10Z & 20Z Injection Moulders
Fames 6C Arbor Presses—½ Price—Presses
Sheldon 12" B.G. Shaper

### AUTOMATICS

Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto., #2 Hand Screw

### BORING MILLS

#0 Giddings & Lewis arr. M.D. 3"
2½" Cleveland arr. M.D., 2½", 4" Binsee
Niles-Bement-Pond 4- duplex, 66" Niles
Bullard New Era 24", 42", King 42"

### GRINDERS

Surface Grinders, 6x18, 8x24, Abrasive, G. & L.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", MD. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.: 1, 3 Univ.

### LATHES

26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond, P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
Wade, Hjorth, Hardinge, P & W Precision Bench

### MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K. & T. Univ.; No. 2, 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos 1½, 2, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller

### HYDRAULIC EQUIPMENT

**500 TON LAKE ERIE PRESS**

Platen 35"x36", 36" stroke, 68" opening, 150 H.P., 220-440 V. Motor.
600 Ton Baldwin South. Platens 76"x50, Stroke 22", Opening 36".
500 Ton H.P.M. Double Action with 100 ton cushion. Platen 36"x36", Stroke 24", Opening 36".
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

**350 TON VERSON PRESS**

40x40 Platen, 36" stroke, 72" opening, 100 H.P. 3 phase—60 cycle 440 volt.

**400 & 500 TON SHAFT STRAIGHTENERS, Self Contained**

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert., S.P.D.
P. & W. No. 12, 1 & 2 spind. Profiler
B & S. No. 1, 3 Vert., Kempsmith No. 1, 2
Taylor-Fenn Spline Miller

### RADIALS

Carlton 8' Arm 19" col. M.D., 3½' Mueller
4', 5', 6' American Triple Purpose
Walker-Turner ½" cap., Cinn. Bick. 6'

### TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B, M.D. Univ.
J. & L. 2"x24", 3"x36", W & S #4, 2A

### MISCELLANEOUS

Buffalo 25UD Comb. Punch-Shear
Pexto 3' to 8' Shears & Brakes
Gorton 1A: 375-2 Tool & Cutter Grinders
Wiedman Turret Punch—Type R4P
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Deckel G1, G2, G1F Engraving machine
Leland-Gifford 1, 2 & 4 spindles, Model MS
Geo Ohl 6' 16 Gage M.D. Shear, 12' 10 Ga. Brake
Oster No. 316B 6" Pipe Threader, M.D.
Bliss 30" Gang Slitter, 19, 20, 21 OBI Presses

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## AARON MACHINERY CO., Inc.

45 Crosby Street
WOrth 4-8233

New York 12, N. Y.
Cable: AARMACH, N. Y.

MDNA

# SEARCHLIGHT SECTION

## PRESSES

2300 ton Bliss Hydr., 3 col. type, 12" str., 50½" sht. ht., dia. bed 115"
375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 36x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 40" stroke
#305 Bliss, 8" stroke, late, w/air cushions.
60 ton, Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel (3).
2300 ton Bliss Hydr., 3 col. type, 12" str., 42'
#56 Toledo 4" stroke, 21x21 bed, 15½" shut height.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss, $850.00 ea.
70-85 ton 4" stroke, 21x27 bed, 110 strokes per min., Bliss, latest type.
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late Type.
Inclinable, new, 20 to 70 ton, immed. dely.

## AUTOMATICS, LATEST TYPE

#0G B & S, late type
1" New Brit. Brd., 6 spdl
1⅜" R4—New Brit. Grid.
1½" & 1⅝" Cone—8 spdl. late
9/16", 1", 1¼", 1⅜", 2", RA6 Acme Grid.
2¼" & 2⅝" Cone 6 Spdl.
16" 8 spdl. Bullard Multaumatics, pract. new, (3) with some tooling, dbl. & sgl. index
12" 8 spdl. Bullards, late type, lots of tooling.

**PAUL'S MACHINERY COMPANY**
MONA MEMBER
**6111 Vermont Avenue**
**Detroit 8, Michigan**
TYLER 7-6300

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# HASCO'S

## LARGE TOOL OFFERINGS

*Immediate Delivery*

FERRACUTE 12'x3/16" Cap. Power Press Brake

GARRISON 14'x3/16" Cap. Power Squaring Shear

BLANCHARD #16A Automatic Rotary Surface Grdr. (36" Chuck)

HEALD #25A Rotary Surface Grdr. (30" Chuck)

PUTNAM 42"x18' or 50' Heavy Duty Geared Head Lathe

KING 52" and 42" Vertical Boring Mills

GIDDINGS & LEWIS #32 Horizontal Boring Mill

*All for Sale by*

**HASCO MACHINERY COMPANY**
**661 FRELINGHUYSEN AVENUE**
**NEWARK 5, NEW JERSEY**
**BIGELOW 3-3486-7-8**

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# HOWARTH

## HAS IN STOCK

No. 56-90 Cincinnati Plain Hydromatic Milling Machine, Tracer Control, Variable Feed Control, Six Months Use

BORING MILL, No. 31 Lucas Horizontal
DRILL, 5' American Triple Purpose Radial
GEAR HOBBERS, No. 12-H and 24-H G & E
GRINDERS, No. 16 Blanchard, 30" Chuck
MILLING MACHINE, No. 1-18 Cincinnati
MILLING MACHINE, No. 4 Cincinnati Universal, Timken Brg., Rect. Overarm
PRESS, No. 3-A Bliss D.C., Tie Rod, SG
PRESS, No. 1B Superspeed, 10 ton, HS
SHAPERS, 16" G & E High Duty, M.D.
SLOTTER, 10" Pratt & Whitney, M.D.
TAPPER, No. 1 Bakewell Precision
THREAD GRINDER, No. TG 615 Jones and Lamson, 1943 machine, Fine Condition
THREAD MILL, 6" x 48" Pratt & Whitney

**HOWARTH**
**MACHINERY COMPANY**
**503 E. 9 Mile Road, Detroit 20, Mich.**
**Phone JOrdan 4-6490**

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## *$1000.00 Under the Market*

Plain Miller—K & T #4 Heavy Duty. Slightly used. Like New. Serial #1-2187. Latest dial type.

Power Rapid Traverse—all directions. Double overarm. Table 16" x 86½".

**PRICE $7500.00**

**KINGS COUNTY**
**MACHINERY EXCHANGE**
**408 Atlantic Ave., Brooklyn 17, N.Y.**

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## FOR SALE

Induction heating generator, model 1400, 25 KW, and work table. Bought last year; used less than four months. Induction Heating Corp. "Thermonic" electronic type; with series resonant work table for heating high conductivity non-ferrous metals (copper, aluminum, etc.); generator alone (without series resonant circuit) suitable for ferrous metals (iron and steel).

PURCHASING DEPARTMENT
**BURNDY ENGINEERING CO., INC.**
**N. Y. 54, N. Y., MOtt Haven 9-3400**

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## FOR SALE — *Ready for Use*

Barnesdril—#307 Single Spindle Hydraulic Honing Machine
Planer—36"x36"x12' Niles-Bement-Pond

**THE VIMALERT COMPANY, INC.**
**Jersey City 5, N. J. Delaware 3-6400**

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# WANTED

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# KELLER TYPE BG1-482

Three dimensional machine, complete with angle plates and a large amount of miscellaneous equipment. New 1943.

**O'CONNELL MACHINERY CO.**
**1825 NIAGARA STREET**
**BUFFALO 7, NEW YORK**

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## MACHINERY FOR SALE

Potter & Johnston 5 DE Machine
3 spindle Gould & Eberhardt 36B Rougher
10" D. E. Whiton Gear Cutter motorized & rebuilt by the manufacturer.
Lodge & Shipley Duomatic Lathe.

SIER-BATH GEAR PUMP & CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

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## WANTED

3—100 K.V.A. Outside Oil Transformers. 6900-7200 Volts Primary to 440 Secondary Single Phase.

**THE CAPITOL MFG. & SUPPLY CO.**
**153 W. Fulton St., Columbus 16, Ohio**

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## FOR SALE

**Froude Water Dynamometer**
Model DPX6 Rated Capacity
1200 H.P. @ 1200 R.P.M.

**JOSEPH HAAG**
347 E. FOURTH ST., WILLIAMSPORT 18, PA.

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WANTED FOR TYPE "D" BULLARD MULT-AU-MATIC 8 SPINDLE, 12" Cap. 4 Universal slides Feed and Speed Gears.

**THE CAPITOL MFG. & SUPPLY CO.**
**153 W. Fulton St., Columbus 16, Ohio**

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## MACHINE TOOLS

42"x42"x12' Cincinnati Planer, 3 Heads, MD
#3B Foster Universal Turret Lathe, 5" hole in spindle
17" LeBlond Heavy Duty Production Lathe, Geared Head 58" centers, MD
1-M Cincinnati Milling Machine
24" Cincinnati Automatic Duplex Mill
16"x6' Lodge and Shipley Geared Head Lathe
Model 40 Lees Bradner Thread Mill (new 1944)
#47A Heald Borematic, Double Spindle (late type)

**CARLSON MACHINERY COMPANY**
**2316 Westbrook Drive, Toledo, Ohio**

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## FOR SALE
## BORING MACHINE

Used Precision EX-CELL-O style 218, double end, 8" diameter bore, 18" Table travel. In excellent condition.

FS-7014 AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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## POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED
MONA MEMBER
JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

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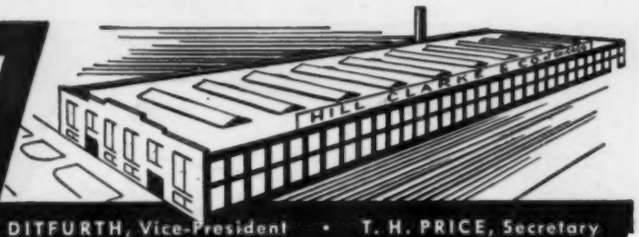
advertising your used or surplus new equipment in the Searchlight Section you turn it into CASH

"SEARCHLIGHT" is the recognized national center for the buying and selling of such equipment.

*For Information Address:*
*Classified Advertising Division*
American Machinist

# HILL-CLARKE MACHINERY COMPANY




ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

Each machine is tested under power. Chief Tester, Louis Hoffman has been with Hill-Clarke 31 years.

## AUTOMATICS

No. 2 Brown and Sharpe
1⅛" Greenlee, 6 Spdls (1941)
No. 61 New Britain 6 Spdls. 2¼" (1942)
No. 6 Brown & Sharpes

## DRILLS

No. D-8 Colburn No. 6 Morse Taper
No. 1LMS—20"—6 Spdl. Leland-Gifford
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—26"—4 Spdl. Leland-Gifford
No. 2MA6—15"—4 Spdl. Avey
No. 2LMS—26"—6 Spdl. Leland-Gifford
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
No. 4 BL Natco 36 Spdls.
7'-15" Col. American Full Universal

## GEAR MACHINES

No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 18-H Gould & Eberhardt
11" Gleason Bevel Gear Cutter
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter
No. 13 Gleason Univ. Tester (1942)

## HOR. BOR. MILLS

No. 31 Lucas, 3" bar
No. 3A Universal, 3" bar
Rockford, 3⅛" bar
No. 46-B Heald

## GRINDERS

4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"

12"x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-38 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1942)

## LATHES

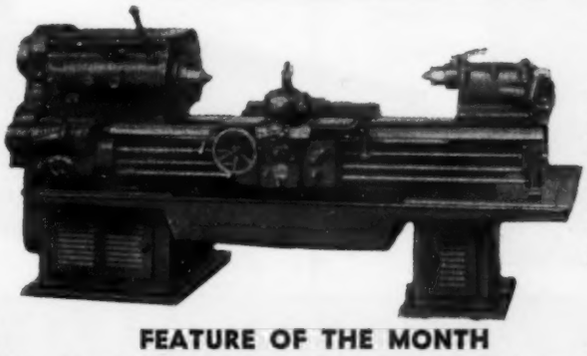
14"x6' Hendey, Yoke Head
15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

## LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo (1942)
20"x25" Fay Automatics (1942)

**FOR YOUR PROTECTION ONLY HILL-CLARKE OFFERS YOU THIS 5 WAY GUARANTEE**

1. A responsible organization—over 80 years experience.
2. Modern machines—no worn out equipment.
3. Every machine remanufactured or carefully inspected by experienced craftsmen.
4. You can see your machine tested under power.
5. Hill-Clarke's unconditional money-back guarantee.



## FEATURE OF THE MONTH

16—18½"x54" between centers. LeBlond Heavy Duty Geared Head Lathe. Motor in Base. Late Model. Ready for immediate shipment.

## MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 08 Cincinnati Vert. (1942)
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand Electromil (1942)
No. M-18 Milwaukee Simplex (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hydromatic (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread Miller (1942)
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Col. Face Millers (1942)
54" x 54" x 8' Davis & Thompson Open Side (1943)

## MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-705 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
No. 22-C Racine Shear Cut Hack Saw
8-M Wells Band Saw
No. 20 Bliss O.B.I. Press
No. 2 V & O open back press
No. 0 Bakewell Tapper
Baush Radial Tapper (1942)

## PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

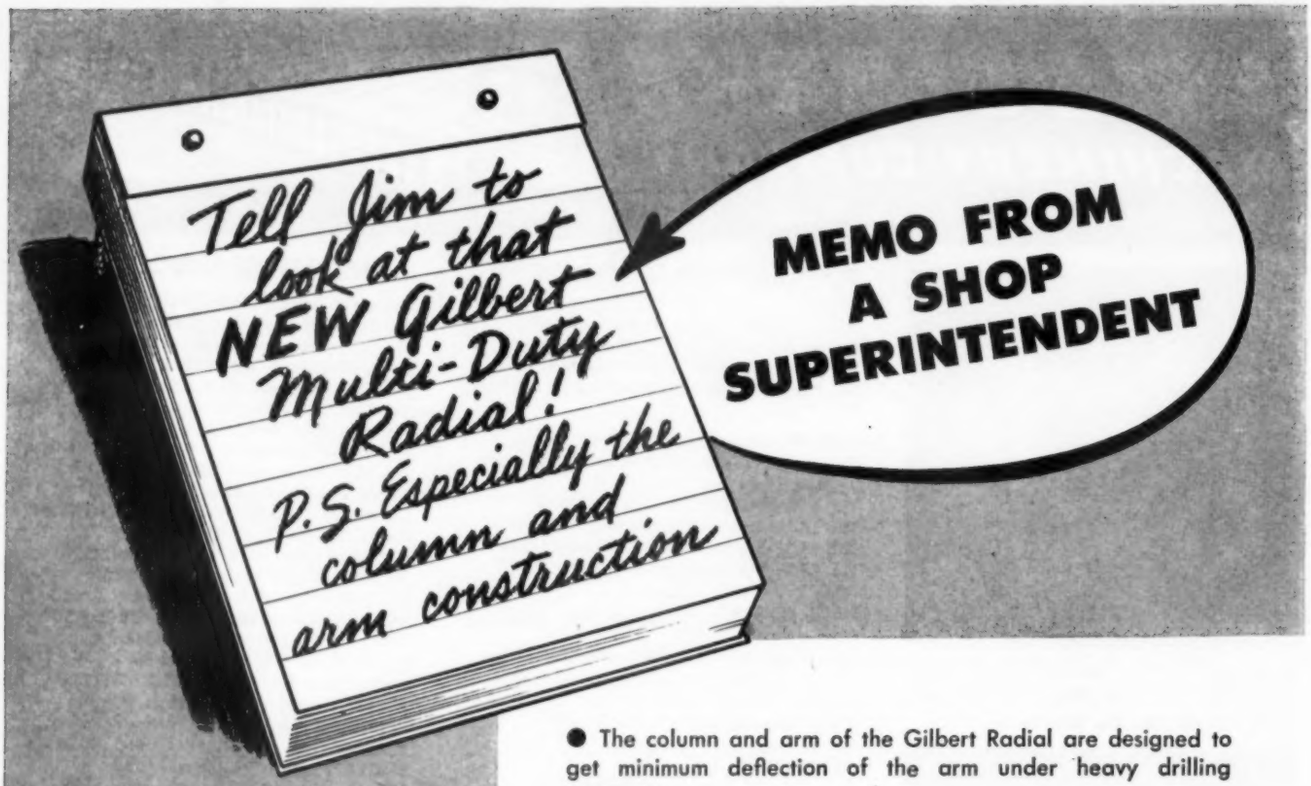
## TURRET LATHES

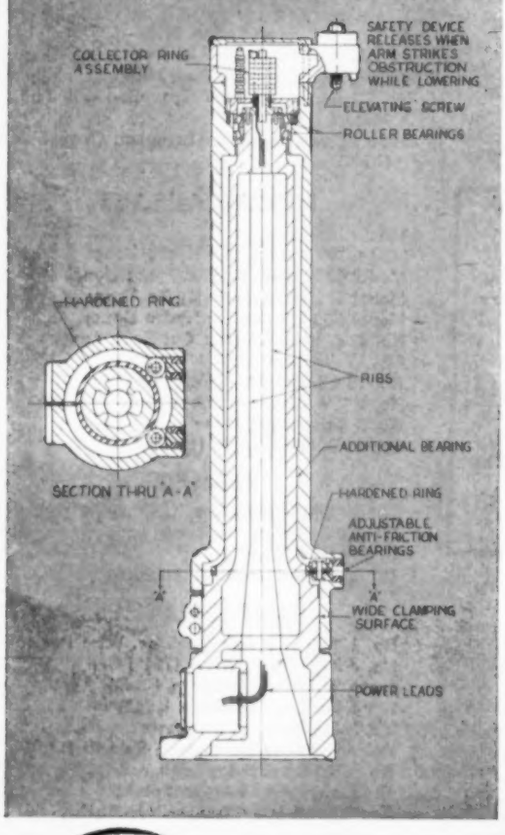
No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Bardons & Oliver (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

## VERT. BOR. MILLS

34" King
36" Rogers, side hd. (1942)
72" Niles Extra Heavy
84" Betts

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. • PHONE FRanklin 2-4761


Tell Jim to look at that NEW Gilbert Multi-Duty Radial!
P.S. Especially the column and arm construction
MEMO FROM A SHOP SUPERINTENDENT

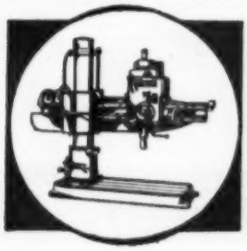



● The column and arm of the Gilbert Radial are designed to get minimum deflection of the arm under heavy drilling pressures.

The column is of proven two piece construction of exceptionally rigid design. The outer column has three bearings on the inner column; two opposed taper roller bearings at the top, two adjustable ball bearings at the bottom rolling on a hardened steel ring, *plus* a third long sleeve bearing. The adjustable lower bearings assure rigid clamping and easy swinging of the arm.

The arm, illustrated below, is of double box section construction with no cored holes on the front or back face. The arm has a long bearing on the column (20½" on the 9" column machine and 23¾" on the 11" machine). Tortional moment is at a minimum because the center of the spindle is only 2½" from the face of the arm.

Thus the Multi-Duty Radial provides all the essentials of rigid construction and proved design that result in easy operation, dependable and accurate production. *Bulletin available.*



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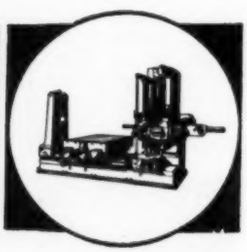

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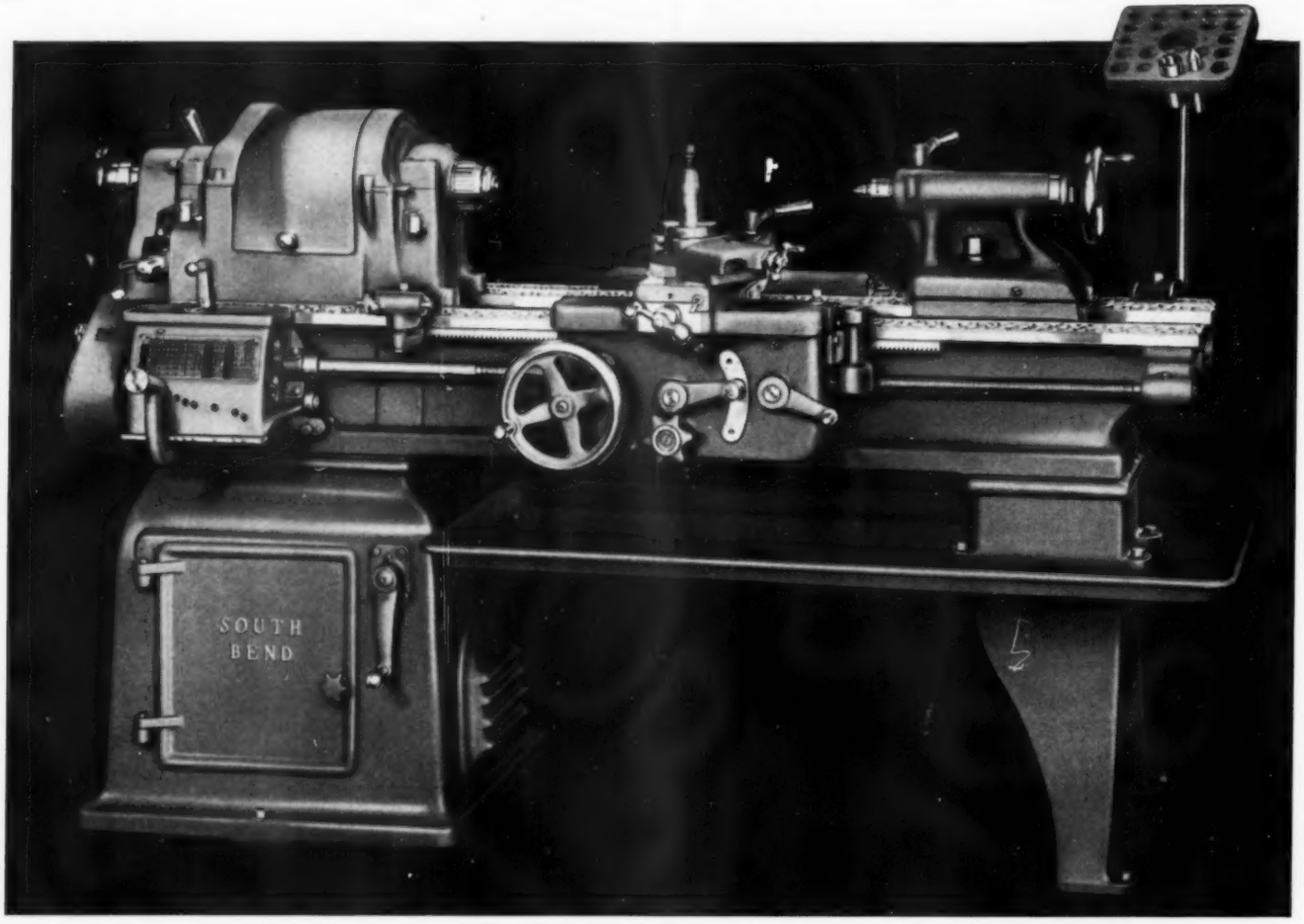


**16" x 6' TOOLROOM LATHE**
with handwheel collet attachment; collet rack; taper attachment; micrometer carriage stop; chip pan; thread dial; 3 phase, 60 cycle, 220 volt motor; and drum switch. Catalog No. 8117-C. **$2145.25**

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## smooth finish and dimensional accuracy on our printing drums"

says D. P. Hoover, Production Manager
STANDARD DUPLICATING MACHINES CORP'N
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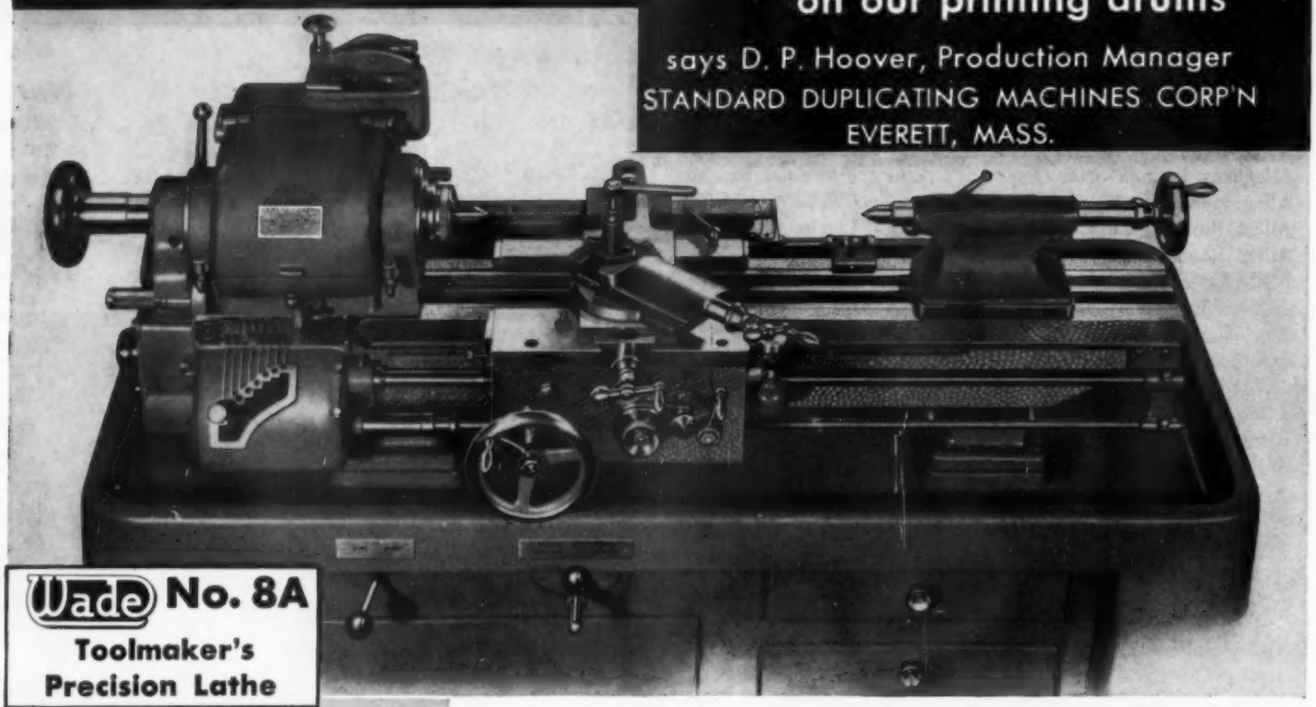
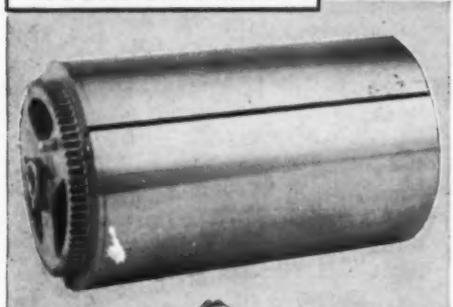
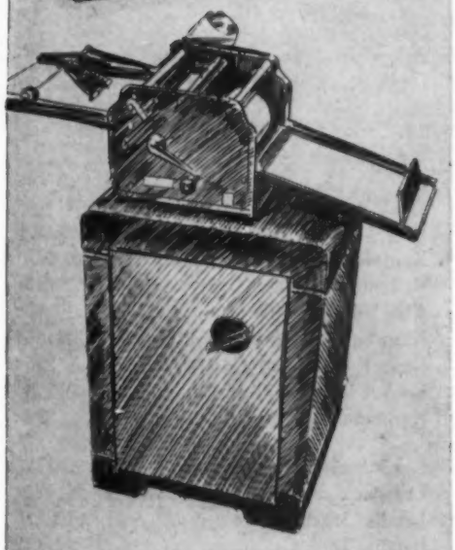


**Wade No. 8A**
**Toolmaker's Precision Lathe**





We had asked Mr. Hoover to tell us ***just why*** he preferred the Wade No. 8A Toolmaker's Precision Lathe for the finish operation on this drum. (He uses a less expensive, less accurate lathe of another make for roughing.) He told us that the 8A lathe has the ***speed*** and ***ruggedness*** he needs for high production output and a smooth surface, using tungsten carbide tools; and it has the ***precision*** that he demands for his final O.D., held to a tolerance of ± .002", and made possible through the rigidity of the spindle and the power of the drive.

One of the secrets of good printing reproduction on this low-priced fluid duplicator known as Model SWA is the great care used in casting and machining the zinc printing drum. This very efficient Standard Duplicator would fall far short of perfection with a poor drum, and we are proud that our No. 8A lathe is helping to maintain quality and speed up production at the Standard plant.

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| | |
|---|---|
| Swing over Bed | 8½" |
| Distance between Centers | 24" |
| Collet Capacity | 1" |
| Taper Standard for Centers | No. 2 Morse |
| Tailstock Spindle Travel | 3¼" |
| Tool Shank Section | ⅜" x ¾" |

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**This is another example of how you can**

## WADE into your work with a Wade

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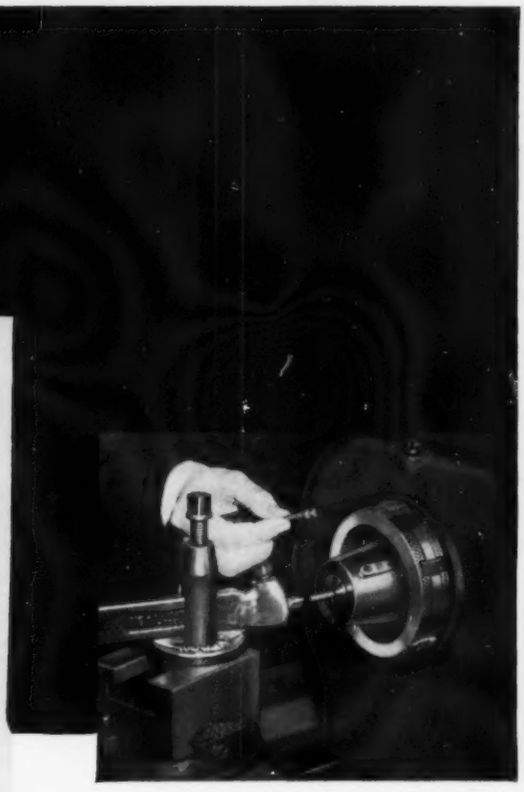
PITTSBURGH PLATE GLASS COMPANY



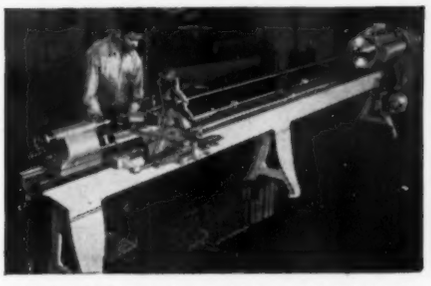
. Here, a 13″ Regal turns small die-shaft to no tolerance. Seven other Regals perform similar die jobs in the same plant.

get versatile metal turning with a LeBlond Regal Lathe

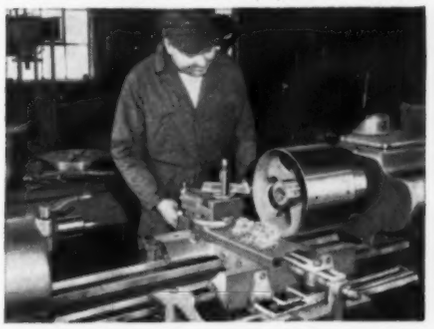
The positive answer to your need for lathe versatility. Regal is quickly adaptable to almost every turning requirement. You can shift easily from large jobs to small, and can obtain amazing accuracy on both. Use these flexible lathes for speedy stock removal on metal, plastics or rubber. Whatever your requirements, if you need a light pattern engine lathe, you need a Regal. Six sizes, 13″, 15″, 17″, 19″, 21″, and 24″, and a 13″ bench model.

For value, versatility, low operating costs—investigate the Regal.

Send for descriptive bulletins today.

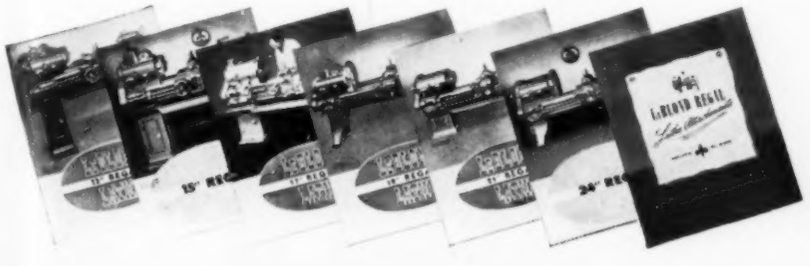


, Intricate machining at the end of a long diamond drill shaft on a 17″ Regal. Lathe has electric brake which is standard on 21″ and 24″ models. Available as extra equipment for others.



Machining a large pulley up to the maximum swing capacity of this 15″ Regal.

**THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO**
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES



LEBLOND

# How TIMKEN® bearings help SKIL Drills fill the bill

WITH Timken® tapered roller bearings on the chuck spindle, SKIL Drills last longer, work better. The heavy thrust loads are carried with minimum friction. Vibration and chatter are eliminated. Moving parts are held in rigid alignment for smoother operation, longer life.

Due to their tapered design, Timken bearings take both radial and thrust loads in any combination. The line contact between rolls and races provides maximum support for the spindle—no chance of deflection. True rolling motion and incredibly smooth surface finish practically eliminate friction.

Made of Timken fine alloy steel, Timken bearings normally last the life of the machine in which they are used. Bearing wear is negligible; spindles retain their precision for long years of service.

Timken bearings in your product add a valuable sales feature. They build greater acceptance for your product among customers. So always look for the trade-mark "Timken" on the bearings you buy. And when buying new machine tools, be sure they're Timken-equipped. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

*This label on a product means its bearings are the best.*

**SKILSAW, INC.** *assure rugged dependability in their models "101" and "121" SKIL Drills by mounting the chuck spindles on Timken tapered roller bearings.*

**TIMKEN BEARING CAPACITY RATINGS INCREASED 25%.**

Since Timken bearings were last re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

**TIMKEN**

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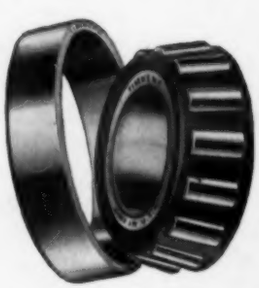
**TAPERED ROLLER BEARINGS**



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ←◫→ LOADS OR ANY COMBINATION ✳